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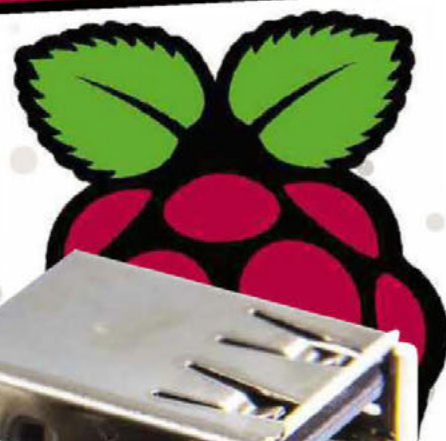
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08 Amazing Pi Projects

08 Amazing Pi Projects

With the recent release of the Raspberry Pi Zero, it's clear that interest in this ARM-based computer is as strong as ever. But whether you have a Zero or a full-size Pi, you need something to do with it. If you're a bit short on ideas, don't despair. We have a whole bunch of them for you right here!

18 Pi HATs

Speaking of the Raspberry Pi, there's another way to get more out of yours, and it's as simple as putting on a HAT. And no, we don't mean you should put a beanie or a beret on it (as trendy as that might make it look). What we actually mean is 'Hardware Attached on Top'. Want to know more? Let David Briddock explain

24 15 Browser Extensions

Web browsers are already feature-rich programs, but that doesn't mean there isn't still room for improvement. With the right add-ons, you can give your browser a whole host of new abilities. Rob Leane picks out 15 of the best



Pi HATs 18



24 15 Browser Extensions

50 Linux Distros

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50 Linux Distros

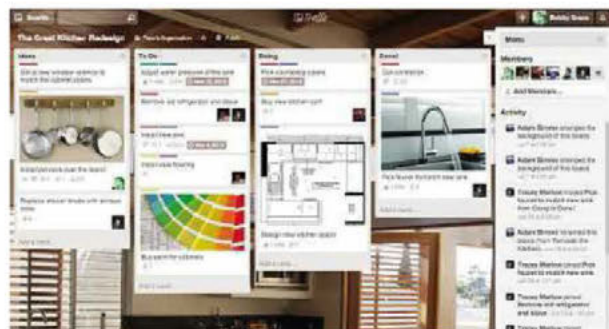
Although Windows is still used by the minority of PC owners, Linux has grown and improved massively over the years. No longer is it difficult and inaccessible, so if you've never tried it before there's never been a better time to give it a go. To help you get started, we're reviewing six distros that could be ideal for you

58 SketchUp

Computer-aided design can be a complex task, but with SketchUp, the process is much more simple. Mark Pickavance knows more than a thing or two about 3D design, and here's here to show you just what you can do with this powerful, but accessible, software

64 Online Collaboration Tools

Thanks to the internet, collaborating with people on projects has become much easier, even if your partners are on the other side of the world. Pinging email attachments back and forth was only the beginning, though. Nowadays, we can actively work on the same things quickly, easily and even in real time. Aaron Birch looks at what's available



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36 Amazing Raspberry Pi Projects

With the Raspberry Pi Zero costing just £4 and the original models continuing to prove popular, **David Crookes** looks at the projects making the most of these bare-bone machines

The Raspberry Pi was launched in 2012 and over the past four years, it has been taken to the hearts of more than six million people. It's the second biggest-selling British computer of all time, behind the far less versatile Amstrad PCW series, but what makes it so special is that it is introducing a whole new generation to the delights of coding. It also allows enthusiasts to exercise their imagination and come up with all sorts of wonderful projects. Here, we take a look at 36 of those.

Pi0Drone tinyurl.com/h43u5su

Even though there are umpteen restrictions in the UK on where they can fly, drones are still soaring high and proving to be more popular than ever. If you want even greater control over the flights you make, then you really ought to consider this new project that not only lets you use a £4 Raspberry Pi Zero, but produces a drone that ultimately shouldn't cost much more than an additional £135. By following the full instructions on the website, you'll get to a stage where you'll be able to control your drone either via wi-fi and a gamepad, or via wi-fi and the Robot Operating System (ROS). If you don't know what that is, then you can read more about it at www.ros.org. What's more, the whole project also looks very smart, which is always a bonus.



Raspberry Pi Microwave

➤ Camera Pi

Camera Pi

davidhunt.ie/?p=2641

David Hunt decided to embed the Pi into a broken battery grip for his Canon 5D Mark II. It allows for wireless tethered shooting via a wi-fi dongle inserted into the USB port and it can also be remotely controlled using a PC, tablet or smartphone. With a Raspberry Pi Zero, we'd imagine that this project can be refined and replicated in smaller cameras or tinier spaces, but even with the larger board of its big brother, it's a fine project for keen photographers, allows you to program computer control for the most demanding of circumstances.



Raspberry Pi Microwave

tinyurl.com/z7mk2vh

Microwaves are the ultimate in convenience and some of us here at *Micro Mart* towers wouldn't be without one (ping, eat, carry on writing). They can always be made even better, though, so we bow to Nathan Broadbent and his brilliant Pi-powered design that allows for a barcode to be scanned, an online database to be searched and food to be cooked for the right amount of time. As well as re-designing his microwave's touchpad and adding better sound, he has included code that updates the clock via the internet and which allows the speedy heater to be controlled using voice commands.



▲ Thermal Printer



▲ Raspberry Pi Lapdock

Beer/Wine Fridge Of Awesomeness

tinyurl.com/qfu2eof

One of the best inventions of all time is the humble fridge: after all, without one you'll struggle to guarantee your beer is well-chilled. But, as with all such things, there is always room for improvement which is why we're rather taken by Jamie Bailey's inspired piece of Pi-engineering.

The Beer/Wine Fridge of Awesomeness works with a beer and wine fridge, instantly letting you know how many bottles you have, the temperature and whether the door is open or closed. The latter feature may seem rather pointless, but factor in alerts on your phone, tablet or computer and you'll always know if someone is after a crafty swig.

The fridge makes use of the Pi, a door sensor, temperature sensor and a Wii Balance Board. It shouldn't cut into valuable drinking time either because it only takes 30 minutes to complete.

Quick Session

We have a natter with Jamie Bailey, founder and CEO of Initial State

Micro Mart: Your tutorial is refreshingly easy-to-follow, thanks to it being very step-by-step. Was that intentional on your part?

Jamie Bailey: Yes! I hate tutorials that leave out 'magic' steps that leave me struggling for hours to figure out how to repeat what the author did. If I take the time to write a tutorial, I make it very thorough so that anyone can go through it without being frustrated.

MM: What part of the fridge are you most proud of?

JB: Figuring out how to repurpose a Wii balance board to be the key component to keep track of beer inventory was the key to this entire project. I thought about using ultrasonic sensors inside the fridge to detect how many bottles are in each row, but that meant more wires hanging out and a single ultrasonic sensor per row (which would have required 14 for my fridge).

I was really surprised at how perfect the Wii balance board fits under a standard mini-fridge and how nonintrusive of a solution it really is.

MM: Has it revolutionised the way you drink?

JB: Haha, no, but it has certainly revolutionized my nephew's drinking (or lack thereof from my beer fridge).

MM: What else do you hope to produce?

JB: There are infinite possibilities for creating practical projects using connected devices inside the home. We have a growing list of high-quality tutorials and projects at www.initialstate.com/learn.

We have a lot of cool projects planned.



Five Slices Of Pi

Multi-Room Music Player

tinyurl.com/mhckenq

This is not only a low-cost tune-streaming solution for four rooms using Spotify – it allows music to be beamed around the house for a total cost of £96.72 including the Raspberry Pi – it's also a well-researched project that doesn't skimp on a quality audio. So if you're in the market for a homemade Sonos-type system, this could be for you.



Coffee Table Pi

tinyurl.com/8jlxxkf

Given the number of retro console emulators that are already out there, there seems to still be a growing number of projects that seek to replicate the feel of old-skool gaming. This gem draws on your woodworking skills and involves mounting a 24" LCD screen and adding arcade joysticks and buttons.



One Button Audiobook Player

tinyurl.com/a32quzk

Some projects have a simple, single purpose, which is certainly the case with this. It only has a single button, which serves to stop and play audiobooks. That may sound rather pedestrian, but for the 90-year-old visually impaired woman it was created for, life has become infinitely easier. A great example of a maker project that really makes a difference.



Raspberry Tor Router

tinyurl.com/gtf2jdn

Privacy is a key concern for a lot of us, so why not make your own router to send your network traffic through the Tor network? You'll find comprehensive instructions on the website and the project is constantly being updated and refined further.



KindleBerry Pi

tinyurl.com/8vmwxn5

It may not be the most practical project around but if you fancy turning a Kindle into a lightweight portable screen for your Raspberry Pi and you don't mind risking your Amazon reader in the process, then you can do just that.



Fisher Price Talking Chatter Smartphone

tinyurl.com/gnowrrw

Grant Gibson has turned a toy phone, which scores of children have pretended to make calls on, into something that can actually dial and be used for a good old natter. By placing a Raspberry Pi inside a Fisher Price toy he bought for his infant son, he has produced something very unique – a proper talking point, if you wish. The whole thing retains the factory look of the phone since he says he was not tempted to add a screen or any unnecessary buttons.

Ring, Ring

We had a chat with Grant Gibson

Micro Mart: Why did you use a Fisher Price toy?

Grant Gibson: This was my third toy modification project. I chose the Fisher Price phone because it's iconic and universal – everyone remembers it from *Toy Story* – plus it has some nice features, like the moving eyes, that are great for modification.

MM: Did you get your son to help you – does he use it more now?

GG: I've done a few hardware hacking projects with my son – last week we built a piggy bank out of LEGO that automatically sorts the coins into separate tubs, and previously we built a biometric security toy box together. But in this particular case it was 90% software development, which is a bit beyond him. He's a bit more into *Pac-Man* than Python. The toy phone is now a fixture in my home office rather than his bedroom, but I'm making it up to him by helping him build a soapbox-style racing cart. It'll have a GPS speedometer, driven from either an Arduino or perhaps the new Raspberry Pi Zero.

MM: How long did it take you to make it?

GG: It took around three hours to do the hardware mods and around eight hours to get the software right. After that there was some audio production work, so probably around two days from beginning to end.

MM: Would you do anything differently?

GG: I'd try to find a lighter action switch for the cradle. The handle of this phone is really light, so it's impossible to get it to press down any regular switch for the "on hook" signal. In the end I had to drill a small hole and fill the handle with sand.



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Five Slices Of Pi

Rapiro

www.rapiro.com

Rapiro is a programmable DIY robot kit that began life as a successful Kickstarter project. Built using just two screwdrivers, it makes use of a Raspberry Pi, allowing all sorts of goodies to be added including image recognition, Bluetooth and wi-fi.



Pi-Saber

tinyurl.com/gwaazs3

Now that you have all seen *Star Wars: The Force Awakens* (you have, right), maybe it's time to try to relive your childhood a little more by creating a new lightsaber. This one is better than putting together a few toilet rolls, we promise; not least because it makes use of a Raspberry Pi Zero.



OwnCloud

tinyurl.com/nl2czbz

If you would like to have your own personal cloud storage then you can't go wrong with OwnCloud which keeps your data private yet nicely accessible and backed up. It is suitable for beginners and – of course – cheaper than the likes of Dropbox.



DeviantArt Picture Frame

tinyurl.com/c5zhfm2

If you would like to display some stunning artwork on your wall, but have it change on a regular basis to keep yourself and your visitors interested, then you can do far worse than draw images from DeviantArt and produce a Pi-powered picture viewer. It's fairly simple and a great project for beginners.



R2-D2

tinyurl.com/aww2fsk

Another awesome project for Star Wars fans, this one makes use of a broken interactive R2-D2 toy. It's pretty advanced with face recognition, motion detection, audio message record and distance detection so it's one to embark on when you have lots of spare time.



Pi In The Sky

tinyurl.com/mb8nmbd

Ever since the Raspberry Pi was launched in 2012, Dave Akerman has been strapping them to high-altitude balloons and firing them into space. By combining the Pis with a webcam, the bare-bones computer is able to take snapshots of Earth from the stratosphere, but the project has also led to some cool talking points.



Chief among them was the release of a toy bear called Babbage – the official mascot of the Raspberry Pi. It was taken to a height of just over 39 kilometres on board a Pi-powered balloon and then dropped, beating the world skydrive record set by Felix Baumgartner in the process. A potato was also launched for TV chef Heston Blumenthal's Great British Food programme.

Flying High

Dave Akerman tells us why he likes the Pi to fly

Micro Mart: How did you get the idea for sending a Pi into space?

Dave Akerman: I'd been flying Arduino trackers for about a year prior to the Pi coming out. I saw that the Pi had a USB interface meaning I could add a webcam and thus send images as well as telemetry down from the payload – something that is rather difficult with lesser computer boards. Live pictures are great because you get to see what that the payload sees in real-time (almost), and you don't have to wait till you recover the payload.

MM: How long had you been working on the project and what challenges did it pose?

DA: I got basic tracking working in a couple of hours, by porting over my Arduino code to work on Linux. Images took a couple of days to get working nicely, and much of those was sorting the power issues (early Pi boards had thermal USB fuses, which caused problems with the high currents used by webcams).

MM: Can our readers easily replicate your work and how would they go about it?

DA: Yes, the tracker schematics and software are both on github so people can take those as a starting point or can just copy them. Or the board can be purchased. The tracker side, though, is just a part of the subject, which includes getting CAA permission, calculating parachute sizes, how much gas is needed, and making predictions of the flight path. All these things are covered in the UKHAS wiki (www.ukhas.org.uk) and various postings on my blog.

MM: What's been most rewarding about the project so far?

DA: That's an easy one – the feedback I get from those who've seen my exploits and decided to have a go themselves.



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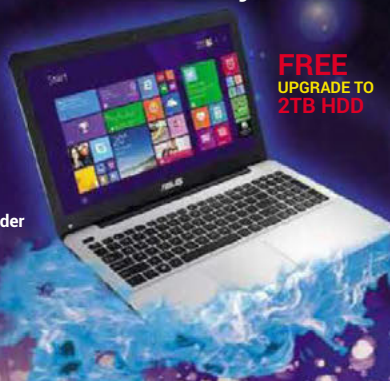
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Five Slices Of Pi

Xbox Zero

tinyurl.com/h6836ev

Grab yourself an old chunky Xbox controller and insert a Raspberry Pi Zero in it: the result is a compact console capable of running a host of retro games that plugs into the TV and is infinitely cheaper than an Xbox One.



BeetBox

tinyurl.com/q92w89g

If you want to groove with the beat, then try tapping some real beets: all you need are some nifty connections to a Pi. By touching the various beet plants, you can send a signal to the amp and produce some amazing drum sounds. Try different fruits and veg too.



Raspberry Pi Light Show

tinyurl.com/mrp7ngu

Great for parties and special occasions, you can make a Raspberry Pi the hub of a cool light show. It's not an easy project, but it syncs with MP3 music in real time, producing stunning effects that would amaze any guests to your Pi-powered abode.



LED Matrix

tinyurl.com/grnxd9t

Intended to produce a scrolling marquee within a desktop box, this project uses a 24x8 matrix as its display and can be used to bring in data from the internet. The possibilities are endless.



Remote Control Car

tinyurl.com/gs7mvtg

Ingmar Stape has built his own toy car out of cardboard and popped a Raspberry Pi into it to allow it to be controlled over WiFi. The full instructions are online, and the end result has plenty of va-va-vrooom!



LED Mirror

tinyurl.com/hzhn2pf

When we look in the mirror we expect to see an exact replica of ourselves which is pretty handy when it comes to combing your hair or checking you haven't got ketchup smeared on the side of your mouth. This LED mirror won't allow you to do that but what it will do is project a silhouette of your body. The effect is rather spectacular.

Johan Ten Broeke produced the mirror as an art installation and while the original is 122cm by 244cm and is made of LEDs spaced 38mm apart, the creator says it can be scaled as much as 16 times its size. To grab your image, it makes use of a Raspicam camera module. It's mounted in the centre of the installation and it's smaller than a coin making the overall effect far more seamless. To the untrained eye, it looks like magic is at work here.

On Reflection

Johan Ten Broeke gives an insight into the production of his mirror Pi project.

Micro Mart: Smart mirrors are said to be the next big thing: why are they useful?

Johan Ten Broeke: We didn't think of it as a smart mirror, it's more of an art installation but, of course it's a mirror in the sense that it reflects the viewer.

Micro Mart: How do you use your mirror and where do you keep it?

JTB: We keep it in our office and we have a big flight case to transport it on top of our van. Every now and then we run it in shop windows or at technology fairs.

Micro Mart: What was the most difficult part of creating the mirror?

JTB: For us, prototyping and designing the hardware, as we are basically software guys.

Micro Mart: What would you do differently if you did it again?

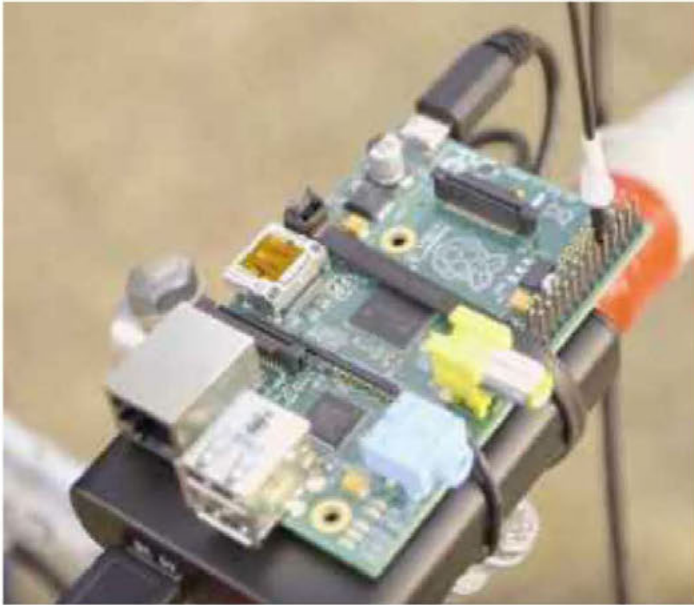
JTB: Yes, the next iteration will be more modular. Particularly the main controller board will be broken up into smaller parts. This will make it easier to build different sizes of the installation.



Thermal Printer

tinyurl.com/glrzhoq

This is a project that requires a bit of outlay – namely a project pack retailing for the equivalent of £130 (although you can buy components separately), but if you want print-outs of data pulled from the internet, then this is a fun and potentially very useful project to try. The creators make some suggestions including printing out the weather forecast or a list of tweets yet the possibilities are as wide and varied as your imagination. It'll work out cheaper than having a standard printer, that's for sure, because the thermal nature of the device means there is no need to buy any ink. We also like the fact that everything is explained in great detail on the website so that anyone can plunge in and try their hand at making it.



▲ PiFM



▲ Pi-Pocket

Raspberry Pi Lapdock

tinyurl.com/hv6trx7

Even though they were intended to be used with a phone, Motorola Lapdocks have long been used by Raspberry Pi owners, allowing them to make use of the device's HDMI monitor, USB keyboard, trackpad and hub. If you are lucky enough to find one on eBay (you can generally pick one up for around £60) or if you have one knocking around doing very little, then you may want to try your hand with this project which places a Raspberry Pi Zero into the machine and essentially produces a fully-functioning, neat Pi laptop. All you need are a few cables and a knife.

PiFM

tinyurl.com/mrcwhnn

If you reckon a life on the airwaves will leave people hanging on your every word, PiFM is the perfect project. It turns a Pi into a FM transmitter with a decent range and it only needs a piece of wire for the antenna. That makes it a very inexpensive and convenient project that can be produced by just about anyone. Head to <https://github.com/Make-Magazine/PirateRadio> for all of the code you'll need but be sure not to choose a frequency that could interfere with broadcasters otherwise you may find the strong arm of the law on your shoulder.

In The Home

Fun projects around the house

1. Pi Doorbell

If someone rings this £17 Raspberry Pi doorbell, you can receive a phone call, text or video stream.

tinyurl.com/l7dq2mj

2. Media Centre

Using Kodi, you are able to turn a Raspberry Pi 2 into a brilliant media centre that is capable of receiving film, music and TV streams.

tinyurl.com/jfmyk7y

3. Pi Clock

It bills itself as simply a Raspberry Pi Clock, but it uses a TV screen and also delivers up-to-date weather.

tinyurl.com/zq8slpn

4. Pi Fridge Monitor

A natty little device that can help to ensure your fridge doesn't lose a lot of heat – when the door is opened, you'll get an email telling you!

tinyurl.com/zcg2k4

5. Magic Mirror

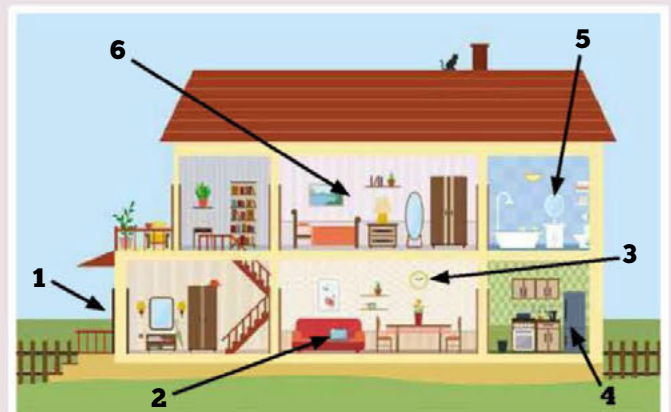
Michael Teeuw's Magic Mirror overlays mirrored glass on a LCD monitor allowing all sorts of internet data to be displayed while you're checking your hair.

tinyurl.com/lttqsxt

6. Bedroom Monitor

When a boy was fed up of his bedroom being messed up, his dad devised a fun camera-based alarm system to help him catch the culprit in action.

tinyurl.com/hygzbe8



Pi-Pocket

tinyurl.com/nqln5pn

While some retro gamers will feel their palms getting sweaty at the thought of tearing apart a Game Boy Pocket to insert a Raspberry Pi, doing so can enhance its portable gaming prowess. Thanks to the use of RetroPie, one of the best mass console emulators out there, this baby can be playing games intended for the NES, Game Gear, Sega Master System and Linux as well as the Game Boy. You'll need to buy a fair few components – including a new LCD screen that will output in colour – but when it's done, you'll have a great handheld machine.

In-car Touchscreen Music Player

tinyurl.com/gtaolqn

The car industry has been known for being behind the times when it comes to in-vehicle entertainment, which is why – until relatively recently – cassette players were still pretty much the standard audio hardware in cars, and why inputs for iPods took so long to be implemented widely. Touchscreens are being introduced in higher end models at the moment, but you don't have to wait to swap your car to get a taste of a state-of-the-art in-car entertainment system: with a Pi and this project, you can produce a system that sings. Well, as long as you pack enough tunes on to a SD card, anyway.

It's certainly not one for the fainthearted, though, and it has to be said: ultimately, you are taking your apart, and that's always a risky activity.

Pi Supercomputer

tinyurl.com/hq7v3xy

Raspberry Pi 2's are powerful little beasts, but if you have the time and resources to connect a few of them together, then you can make for an even better overall machine. This project's creator, Jeff Gerling, calls the resulting cluster he created the 'Dramble' since it runs Drupal 8.

If you like the sound of that, then you can follow in his footsteps by taking a trip to the wiki, which explains how to do it all (www.pidramble.com). The source code you need is available at github.com/geerlingguy/raspberry-pi-dramble. Watch out too for a new Raspberry Pi Zero cluster that is in the works, grouping together 16 of the little blighters – though how they managed to get their hands on that many in the rush that followed them going on sale is still unclear.

Spaceflight Cases

tinyurl.com/zw3xezw

Currently the International Space Station boasts the British astronaut Tim Peake as a resident. However, amid all the fanfare surrounding him being the first Britain to undertake a spacewalk you may have failed to notice that there is a Raspberry Pi also on board. In fact there are a few, and these so-called Astro Pis are running experimental Python programs that have been written by school pupils.

To make them safe to use in space, the computers have been wrapped in a special case that took months to get right and cost £3,000 to develop, but now it's perfected, you can print your own 3D version of (if you have access to a 3D printer, that is) by downloading the necessary files from the Raspberry Pi official website, and begin to come up with your own spacey snippets of code. [mm](#)

Power Cat Feeder

tinyurl.com/k5ho4q6

The internet is awash with cats, we all know this, but the technology/cat crossover is not limited to cute YouTube videos and memes. Oh no.

If you have any moggies of your own, you'll know how hungry they can get. So what happens when you go out? Well, if you know you're going to be away and you feel leaving a huge bowl of biscuits out for them will only cause them to eat until they become sick, and you would rather not impose on a friend or neighbour for regular feeding, then producing an intelligent feeder with a Raspberry Pi at its heart could be the answer.

It's not the nicest looking device in the world, we'd admit, and it most likely won't work with Whiskas chicken in jelly (other cat foods are available) – but these are factors you could work on refining in your own version. At least it works via wi-fi and is easily expandable. Indeed, the addition of sound clips, a camera and a webUI are all possible. You'll struggle to find an off-the-shelf equivalent, that's for sure.

How It Works

1. The project uses a snack dispenser bought from The Container Store in the US (it ships to the UK too). It doesn't appear to be available any more, but you can find others that can be adapted.

2. A continuous rotation servo is attached to the handles so that they can rotate the flapper wheels inside the container, allowing for a portion of food to be dispensed. You'll need to do some cutting.

3. As well as the Pi itself, grab hold of additional equipment including the Small-Size Perma-Proto Raspberry Pi Breadboard PCB Kit. A full list of what's needed, from PVC pipe to the power supply, can be found over at bit.ly/1W7hRQT.

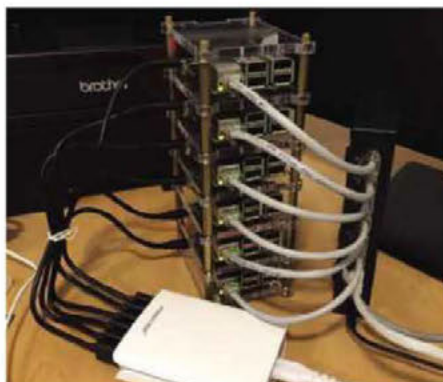


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MOST POPULAR



▲ In-car touchscreen music player

▲ Pi Supercomputer

▲ Astro-Pi case

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Raspberry Pi HATs

David Briddock suggests you try on a Pi HAT

The Raspberry Pi is an excellent hardware hacking computer. Take your Pi, connect a solder-free breadboard to the General Purpose Input/Output (GPIO) port, plug in a few electronic components, and a whole new world opens up.

The possibilities offered by hardware hacking are difficult to resist. However, not everyone has the inclination or time to construct electronic circuits from scratch. And this is why Raspberry Pi add-on boards have become so popular.

Pi Add-on Boards

As Raspberry Pi sales climbed year on year, electronic designers saw a golden opportunity to extend the Pi's functionality by adding LEDs, buttons, joysticks, sensors, motor controllers, analogue-to-digital convertors, mini-LCD displays and much more.

So they began creating add-on boards that simply snapped onto the Model B or Model A using its 26-pin GPIO connector. With an add-on board it's so much easier to create a home automation system, build a security camera, construct a weather station or control a motorised robot.

However, it's not quite as straightforward as it might at first seem. In fact, there are a number of tricky hurdles to overcome.

First there's the driver problem. You have to identify and obtain the drivers associated with each add-on board. Then you either load them by hand, from the Linux command line or carefully edit the relevant Linux files so they load at boot

time – quite a challenge for novice Pi owners.

Another issue is that when loaded, these drivers assume they can make exclusive use of the GPIO interface. But as this isn't always the case, it can lead to quite a few head-scratching problems.

The root cause of these problems is that a Raspberry Pi can't easily determine how best to communicate with an add-on board, or even identify whether one is currently attached. This means it's

The reason for these extra pins became apparent just a few weeks later when the Hardware Attached On Top (HAT) initiative was announced. For the first time add-on board designers, had an officially endorsed specification that, if adopted, would make Pi hardware hacking much easier.

Essentially, every HAT conforms to a specific set of rules. These rules enable the Pi to detect the presence of a HAT and automatically configure the GPIOs

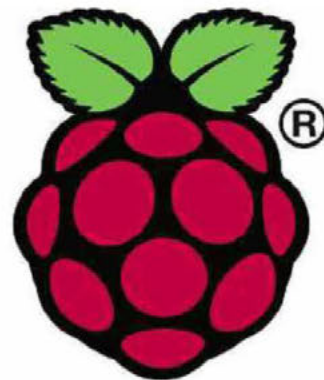
“ You can even replicate the experiments astronaut Tim Peake will perform aboard the International Space Station ”

impossible to assist novice users with driver selection and configuration suggestions.

The Raspberry Pi Foundation realised it could improve this situation significantly and in the process open up the Pi hardware hacking experience to a wider audience.

HAT Birth

In July 2014, the Raspberry Pi Foundation introduced an updated version of the original Model B. Named the Model B+, it had a number of useful enhancements (goo.gl/s5asMa). One of the most significant was an extended 40-pin GPIO connector.



Raspberry Pi

and drivers for the board. In other words, a Pi owner only has to push a HAT onto the GPIO connector and boot up the Pi.

From a technical perspective, the auto-configuration is down to GPIO pins ID_SD and ID_SC, which are reserved for an I2C EEPROM. The HAT's EEPROM holds the board manufacturer information, GPIO setup and a hardware description

Now let's take a closer look at some of the more popular HATs.

Explorer HAT

The Explorer HAT from Pimoroni is all about smoothing your introduction to electronic circuit building. This HAT snaps a miniature breadboard directly onto your Pi, so there's no need for connecting

library, which makes HAT interaction a much simpler task. There's no limit to the things you can do with an Explorer HAT, but here are a few ideas to get started:

- An LED light puzzle game using the Pro's touch pads (goo.gl/gkhGxC).
- A PIN-secured alarm system (goo.gl/5uYKOb).
- A circuit that uses an analogue temperature sensor and displays the data via the Pi's Minecraft Python programming interface (goo.gl/92XUnm).
- A USB keyboard robot controller using the PyUSB module (goo.gl/5uYKOb).

“ Add a HAT to your Pi and you open the door to myriad creative possibilities ”

that Linux uses to automatically load the required drivers.

To ensure everyone has an opportunity to design and build their own unique board, the complete HAT technical specification, including circuit diagrams, is open source (github.com/raspberrypi/hats).

HAT Zoo

Just like an add-on board, a HAT enhances your Pi with a new collection of capabilities. But this time the board is installed and working in minutes, so you can have all the fun without doing those tedious configuration tasks, which are so easy to get wrong.

Each certified HAT board must adhere to the official specification, have the same basic rectangular 65 x 56mm size, a 40-pin GPIO connector and four mounting holes that align with the mounting holes on the Pi.

But that's where the similarities stop. Each one has its own specific purpose and set of functionality. Some encourage circuit building experimentation. Others add a collection of environmental sensors, control electric motors or interface with Pi accessories, such as TFT screens.

There are many places to buy a HAT. Take the popular Pimoroni website, for example. As I write, it already has 27 different HATs on its virtual shelves (goo.gl/2efx2v) and new ones are added quite regularly. The Pi Hut also has over 20 HATs (goo.gl/MGJWj2) as does Adafruit (goo.gl/Fs9yrr).

With a HAT it's much easier to attempt maker-style projects. Examples include light-sensitive mood-lighting devices, garden weather stations, motion-sensor security systems, time-lapse video surveillance setups and all kinds of robots.

wires. This arrangement is also ideal for maker-style projects where space is at a premium, such as small robots.

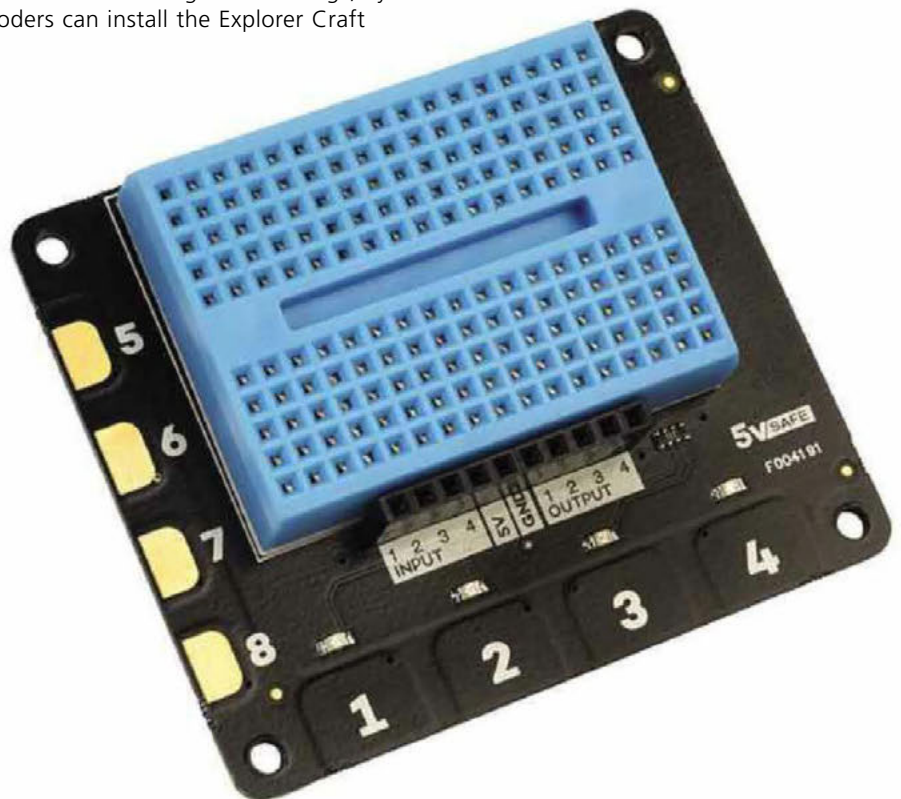
The Explorer HAT actually comes in two versions: the £10 Standard and the £18 Pro. The cheaper Standard HAT has four buffered 5V tolerant inputs and outputs, four capacitive touch pads, four capacitive alligator clip pads, four coloured LEDs and that mini breadboard. The Pro HAT adds four analogue inputs (for things like thermometer sensors), two 5V bidirectional motor drivers and an array of 3.3V GPIO connectors.

As for the coding side of things, Python coders can install the Explorer Craft

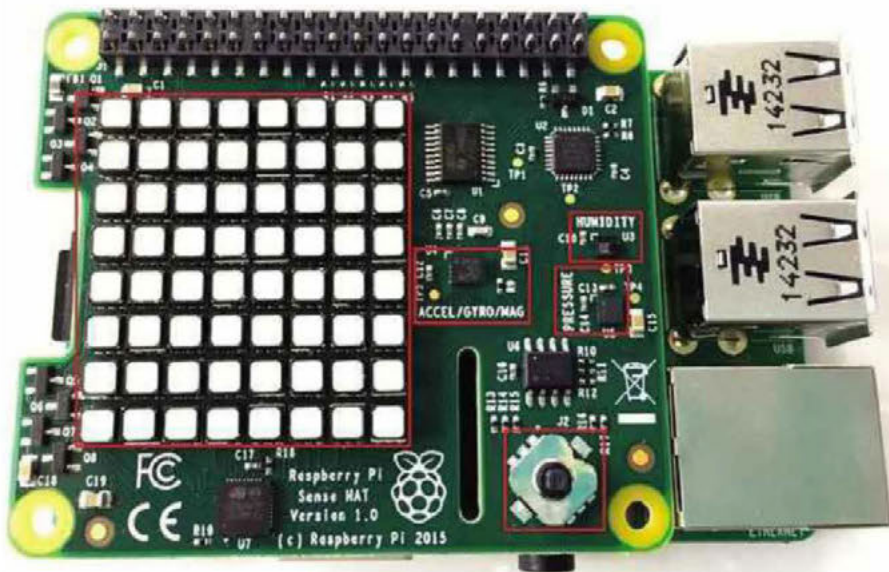
Sense HAT

The Sense HAT is one of the more expensive products, at around £25. However, it's a true multi-functional beast and therefore offers excellent value for money. Here's the feature list:

- Gyroscope
- Accelerometer
- Magnetometer
- Temperature sensor
- Humidity sensors
- Barometric pressure sensor
- 8x8 RGB LED display
- Mini five-button joystick



▲ Explorer HAT



▲ Sense HAT

The gyroscope measures the Pi's orientation as angles between 0 and 360 degrees, in terms of pitch (up and down), yaw (left and right) and roll (like a corkscrew motion). The accelerometer measures the Pi's acceleration and also detects the direction of gravity, so it knows about the Pi's orientation. The magnetometer measures the strength and direction of a magnetic field.

Climatic conditions are captured via a temperature sensor that acts as a Celsius thermometer. The humidity sensor detects the amount of airborne water vapour, and the barometric pressure sensor measures forces exerted by tiny molecules in the surrounding air, which change depending on altitude.

On-board visual feedback is provided via an LED matrix display in the form of an 8x8 grid. Each LED has a red, green and blue component, fully controllable through code. Combine red, green and blue values to create any colour or shade. These 64 RGB LEDs can display sensor data visualisations or real-time, multi-colour animations.

The mini joystick has five direction buttons – up, down, left, right and centre – just as you'd find on a typical games console controller. Thanks to the HAT auto-configuration, they'll already be mapped to the four keyboard cursor keys plus the return key.

As for coding, Scratch fans will find the 'SenseHAT' add-on block easy to use, while Python coders have the 'sense_hat' module (pythonhosted.org/sense-hat), as shown in the code

fragment below:

```
from sense_hat import
SenseHat
sense = SenseHat()
t = sense.temperature
h = round(sense.get_
humidity(), 1)
p = round(sense.get_
pressure(), 1)
```

With so much flexibility, it's no surprise British astronaut Tim Peake took a couple of Sense HAT-fitted Raspberry Pis with him as part of the Astro Pi project during his six month stay on the International Space Station (ISS).



▲ SkyWriter HAT

HAT Links

Spec: github.com/raspberrypi/hats
Pimoroni: goo.gl/2efx2v
The Pi Hut: goo.gl/MGJWj2
Adafruit: goo.gl/Fs9yrr
Astro Pi: astro-pi.org

Sense HAT Projects

Martin O'Hanlon: goo.gl/Sh8AQL
Ben Nuttall: goo.gl/97YNvs
Ben Nuttall (8x8 LEDs): goo.gl/ubjrzg
Dave Honess: goo.gl/M0XVV8

However, you could cook up some scientific experiments yourself. The Astro Pi website has both Python and Scratch tutorials (astro-pi.org/get-involved/program-the-sense-hat), plus there's plenty of Sense HAT examples online, such as the fun space-centric Scratch coding tutorial by Milton De Paula (goo.gl/efjKzl). For more links see the Sense HAT boxout.

Skywriter HAT

If you'd like to upgrade your Raspberry Pi with something that's both unusual and fun, then the £16 Skywriter HAT might fit the bill. Once installed, the Skywriter can sense the position of your fingers in the air above its flat metal plate.

To establish this intriguing capability, it generates an electrical field above the metal plate. The strength and shape of this field is remodelled as you wave your hand and fingers around. Skywriter's



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▲ *Astro Pi*



▲ *Astro Pi on the ISS*

built-in sensors capture these field changes, then the HAT driver software converts them into 3D positional data and meaningful gestures.

Even better, the Skywriter HAT has a sensing distance of up to five centimetres, so you could mount it in stealth-mode behind a sheet of non conductive material – for example, an acrylic or fabric cover. Hidden from sight in this way, it becomes a kind of techno-magic illusion.

Use the associated Python library to read off the positional data as x, y and z coordinates. The same Python library can identify common gestures like taps, double taps, flicks and side-to-side swipes. All the Python code is open source and available to download from GitHub (github.com/pimoroni/skywriter-hat).

What you can do with a Skywriter HAT is really only limited by your imagination. Some of the more obvious examples include a mouse replacement to control your Pi's user interface, a custom 3D game controller or a Python app that simulates the theremin musical instrument. But I'm sure you can think of many other interesting possibilities.

Pi Zero HATs

The Pi Zero has undoubtedly kicked off a new wave of interest in all things Raspberry Pi (as we discussed in issue 1392), and priced at just £4, there's more money to spend on accessories. While a few things are omitted on the Pi Zero to attain that amazingly low price, it does retain the same HAT-compatible 40-pin GPIO connector found on the Pi 2, Model B+ and Model A+.

However, the board itself is much smaller in size. This means a standard-sized add-on board or HAT rather overshadows the diminutive Zero board. Apart from aesthetics issue, a bigger problem is that the mounting holes don't line up any more.

To fix this problem, a number of manufacturers have introduced a range of Zero-sized add-on boards. We'd also expect a range of made-for-Zero HATs to appear pretty soon. And if the Raspberry Pi Foundation is reading this, a few million Pi Zero boards would be welcome too!

Summing Up

The HAT specification is a game changer in the Raspberry Pi hardware hacking

game. The ease of installation and quick-start features are a boon to any Pi owner with limited Linux knowledge, and it's especially suited to students, parents and teachers.

Add a HAT to your Pi and open the door to myriad creative possibilities, where there are new things to explore, new skills to learn, new code to write and new Pi-centric dreams to realise.

Have fun and let us know what you create. [mm](#)

Astro Pi

The Astro Pi project (astro-pi.org) clearly demonstrates the power of the HAT concept. Adding a Sense HAT and a few other inexpensive electronic components transforms the humble Raspberry Pi into a high-quality scientific instrument.

So, what exactly is an Astro Pi device and can you own one? Well, it's built on a standard Raspberry Pi 2 board with a Sense HAT attached, plus the official camera module, an infra-red camera module (the official camera module minus its infra-red filter) and a custom designed flight case (astro-pi.org/about/hardware).

So yes, you can own an Astro Pi because, except for the 6063 grade aluminium flight case (only eight were made in total), everything is available to buy. And you can easily purchase a suitable case, construct one yourself or create a design and have it 3D printed.

Two Astro Pi devices were flown to the ISS. During Tim Peake's mission, they'll become scientific instruments that measure the environment inside the station, reveal how it's moving through space and detect the earth's magnetic field.

The low cost nature of the Astro Pi hardware offered a unique learning opportunity. Last year, students from schools from all over the UK took part in an Astro Pi competition (astro-pi.org/competition). The challenge was to create the best scientific Python-coded programs for the Astro Pi.

In the end, seven winners were chosen, spanning a number of different age groups. The programs range from game-like reaction time tests to monitoring radiation levels inside the ISS (astro-pi.org/competition/winners). To find out more and to try these programs for yourself, visit the Astro Pi GitHub site (github.com/astro-pi) and download the source code.

Tim Peake will run each winning program inside the ISS European Columbus module, before downloading the results back to earth for all to see. Even when Tim's mission has finished, a long-term ISS environmental monitoring programme will continue to run these experiments, adding the recorded sensor data to a date and time-stamped CSV file.



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15 Browser Extensions To Make Your Life Easier

Rob Leane investigates the life hacks on offer from free browser extensions...

Browsing the web is a big part of our daily routines these days. If you're anything like me, it probably dominates your work life and your personal time. The internet is a trusty tool for all of us, but there are ways to make it even more effective.

These come in the shape of browser extensions – freebie plug-ins that add extra features to your browser, such as blocking movie spoilers, sorting out your spelling and

managing your manifold open tabs. Life can be so much easier if you install a few of these...

15. TabCloud

Have you ever had so many tabs open that you're scared to leave the office or close your laptop lid, because there's no way you'll remember what they all are next time? Or perhaps you want to switch devices but can't be bothered to open all these tabs again? Tab Cloud is the perfect solution in situations just like this.

This helpful extension lets you save your browser windows – and all the tabs they entail – and restore them at a later point in time, from the same device or a different one. It's all saved to your Google account, and you can access your windows from anywhere.



You can save all your work-relevant tabs as one window and all your personal-time favourites as separate set. With Tab Cloud, You'll never again have to faff around trying to remember which tabs you had open yesterday afternoon (or any other time).

14. Tiny Filter

Tiny Filter is a really handy one. Whatever you want to block you or your fellow device-users from seeing, this extension lets you set up the relevant filter. I recently used it to block *Star Wars* spoilers from showing up on my social media news feeds and the sites that I visit, but that's just one of the possibilities with Tiny Filter.

If you want to stop NSFW content appearing on your Facebook feed, or swearword-stuffed articles from opening, or football results from popping up and ruining your enjoyment of *Match Of The Day*, Tiny Filter can help.

If you have children, you can use Tiny Filter to stop them seeing anything inappropriate. You just need to tell Tiny Filter the terminology you wish to block, set a password for the browser extension that your kids can't guess, and then you'll be sorted.

13. Wikipedia Quick Hints

If you're the sort of person who goes to Wikipedia to look something up and ends up tumbling down an endless rabbit hole – wasting far too much time clicking on page after page of irrelevant drivel – then you need to install Wikipedia Quick Hints pronto.

Instead of letting you get trapped down this rabbit hole, Wikipedia Quick Hints allows you see a quick definition of a term by hovering over it with your cursor, negating the need to open another web page. It's a time saver and really helps keep your focus on the initial task you popped onto Wikipedia for.

Other features include automatic zooming of images (when you hover over them) and the ability to 'mark' certain articles that you need to come back to later. Admittedly, this one's useless if you're not a Wikipedia user, but it's an absolute lifesaver if you're a regular to the site.

12. IE Tab

It's very annoying when you find yourself in Chrome, Safari or Firefox but get told you need to use Internet Explorer to access a certain page. Admittedly, this is happening less and less these days, but it's still a pain in the bum when you're asked to switch over to IE to complete a basic task.

IE Tab is your best way around this. It lets you open a fake Internet Explorer tab within Google Chrome, which seems to trick most websites that demand IE into believing you've actually switched browser. It saves you a fair amount of hassle in the process.

Personally, I use IE Tab for video websites like Now TV that require Silverlight (unavailable on my main browser, Chrome) in order to work. Comes in very handy.

11. Grammarly

How's your spelling and grammar? If your answer to that question falls somewhere between 'could be better' and 'ruddy awful,' you might want to install the Grammarly browser extension. Almost anywhere you can write on the web (including Gmail, Facebook, Twitter, LinkedIn and Tumblr), Grammarly is capable of scanning your text and spotting errors.

Grammarly is smart too. It doesn't just spot misspelled words that don't exist. It also builds your vocabulary by discouraging vague words, steering you away from 250 common grammatical errors, and even telling you when you

“ The internet is a trusty tool for all of us, but there are ways to make it even more effective ”

might be using a word in the wrong way (e.g. it can clock whether you're using commonly confused words like 'affect' and 'effect' correctly).

For the truly paranoid folk out there, Grammarly also offers a paid service that scans for an extra 150 grammar mistakes. The paid version can also tell if you're plagiarising from another source, and offers suggestions about citation.

10. Pocket

Pocket is an extension/app designed for busy people who don't always have time to read the articles and web pages that intrigue them. Rather than ending up with a list of bookmarks that stretches on forever, or an inbox full of links you've sent to yourself, Pocket lets you easily store content that you want to come back to.

It works for articles, videos and web pages, and allows you to sort them into whatever categories you want. For example, you could have a recipes folder, a funny YouTube clips folder or a folder dedicated to holiday ideas. You'll never forget where you saw a link again.

Pocket stores everything you save to as many devices as you like. You could see something on your phone, stick it in Pocket and come back to it on your laptop later on. It also saves offline versions of everything, so you can even browse content when you're away from the internet.

9. Mighty Text

Mighty Text is incredibly convenient for users of Android phones. It allows you to sync your computer's browser to your phone number, meaning all your texts, calls and picture messages are accessible within your PC.



Mighty Text makes it easier to send quick replies without switching your focus from your computer to your mobile, saving you from productivity-diminishing pitfalls. No longer will you respond to a text and end up accidentally playing *Angry Birds* for half an hour. As a freelancer with a limited attention span, I find this very helpful.

Also, receiving texts on your PC means that if someone texts you a link, you can access it immediately on your PC rather than faffing about reading it on your mobile or emailing it to yourself.

8. Project Naptha

Project Naptha can save you from one of my major bugbears on the internet – that frustrating moment when you realise the text you wish to copy and subsequently paste is embedded within an image, a PDF or a screenshot, and therefore can't be selected by your cursor.

Before Project Naptha, I would have had to transcribe this text, wasting my time by physically copying out something that

“Mighty Text makes it easier to send quick replies without switching your focus from your computer to your mobile”

feels like it should be easy to grab. Now, with Project Naptha, it finally is.

You just need to hover over the text you want within your browser (regardless of the type of image or files it's in), wait a few seconds, and you'll be able to copy and paste it with ease. You can even translate words. You may not have to use Project Naptha often, but being able to interact with text like this is much more user-friendly than the standard way in which browsers work.

7. One Tab

Tabs can be the bane of your online life. It can really throw a spanner in the works of your productivity levels when you look up to the tabs bar and see nothing but a row of tiny icons. Lots of us need to use multiple websites at once, though, so it sometimes seems like there's no way to avoid this chaotic-looking outcome.

But OneTab offers a solution. When you find yourself with too many tabs open at a time, you can just click on an icon in the top right, and it will convert all your tabs into one simple list. From here, it's easier to keep track of all the things you have open.

You can reopen the ones you're actually using and close the rest, or you can keep the list to one side and come back to it later. Not only is this a handy tool to sort the wheat from the chaff, but it also reduces the amount of memory you're wasting.

6. Ghostery

If you've ever worried about how many companies and websites are storing information about you while you browse, Ghostery is the perfect browser extension for you. It lets you see what its developer terms 'the invisible web', revealing the sites that are tracking your habits and keeping records on you.

The results of using Ghostery are highly enlightening. I opened a page on a favourite website of mine, and found that more than 30 entities – mainly advertising companies – were storing information based on my presence. I didn't even click on anything on the page; I just opened it! Creepy.

Winningly, Ghostery also allows you to prevent companies from storing information about you. If you're not particularly keen for ad companies to know your every move, you can politely tell them to sod off. Ghostery essentially saves you from having to visit the cookies information page on every site you visit, which is a genuine time saver that can make you feel more secure online.

5. Gmail Offline

This one's really handy for those who travel around a lot and/or work between several different locations. Gmail Offline automatically synchronises your incoming mail and completed pre-queued actions whenever you have an internet connection.

This means you can download all your emails when you're in a coffee shop connected to the wi-fi for five minutes, compose your responses while you're offline, and they'll all be sent as soon as you get connected again. Easy peasy. This makes it much easier to work on public transport or other areas of inconsistent internet signal.

Gmail Offline also allows you to search your old emails while offline, assign folders to messages and archive stuff you don't need any more. All this means that even when you're offline, you can be working away. It'll all be finalised when you connect again.



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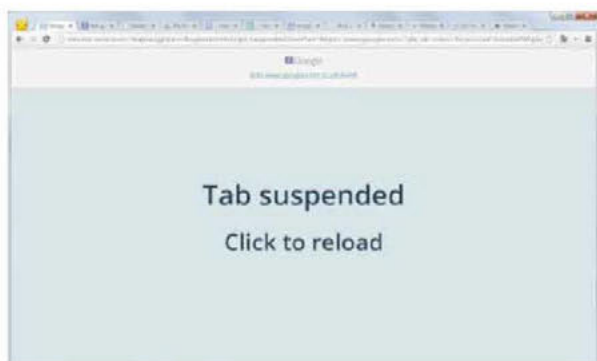
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4. The Camelizer

If you ever feel you're being mugged off by a website that's upped its prices since the last time that you checked, the Camelizer is the browser extension you need. It can determine whether the price has actually changed or if you're just being paranoid. More often than not, you'll probably find your suspicions were correct.

What's more, when you realise that the product you're after used to be much cheaper, you can give the Camelizer your email address along with your desired spend, and ask it to notify you when the price matches what you're willing to pay. This ensures you'll never miss a bargain again.

“ StayFocusd is ideal for those who need to be online for their work, but get easily distracted ”

Ingenious, simple to use and completely free, the Camelizer is well worth downloading the next time you're thinking of spending money online. It's especially worthwhile when it comes to buying tech products from major retailers.

3. The Great Suspender

Here's another browser extension that wants to help with your out-of-control habit of opening tabs and never closing them. The Great Suspender prides itself on automatically suspending tabs you're not actually using, saving you from splurging bandwidth unnecessarily. It doesn't close them, but it just stops the wastage.

When you pop back to a tab that's been suspended, you can reinstate it with a click when you're good and ready. This means that memory doesn't get gobbled up, and your computer won't slow down like it does when you have a zillion active tabs on the go at once.

You can choose how long it takes for a tab to time out and select tabs that you don't want to be suspended, no matter how long you don't visit them, meaning you're in control at all times and you won't lose any data.

2. Office Editing For Docs, Sheets & Slides

A free alternative to Microsoft's own Office Online app (which you have to pay for), Google's Office Editing For Docs, Sheets & Slides is a great way to peruse documents without having to download them all and waste your storage space.

It works with Word documents, Excel spreadsheets and PowerPoint presentations. You can edit files through it too, which puts this extension far above the collection of view-only equivalents on the market.

This extension is convenient in a number of situations, not least if you don't have Microsoft Office on the laptop or PC at hand. Also, it's perfect if you're sent lots of files but don't have the space to store them. It saves you from clogging up your computer with stuff you don't actually need, which is hugely helpful by anyone's books.

1. StayFocusd

A browser extension to live by, StayFocusd is ideal for those who need to be online for their work, but who get easily distracted by their favourite websites on a daily basis. It lets you control your own browsing habits and keep yourself on-task despite all the internet's distractions.

The idea is to tell StayFocusd your most productivity-sapping online haunts and use it to enforce a strict daily time limit. You can set a half-hour limit on Facebook procrastination per day, for example, and StayFocusd won't let you go over that. It'll show you a countdown at all times, so you're doubly aware of the time you're wasting.

If you're really struggling, there's also StayFocusd's 'Nuclear Option,' which blocks absolutely everything non-work related for a pre-specified amount of time. It's impossible to switch off StayFocusd during a nuclear session, meaning you can't cheat the system all that easily.

Put simply, StayFocusd is an absolutely ideal tool for anyone who struggles to be productive, and it won't cost you a penny to add it to your browser. What more could you want? [mm](#)



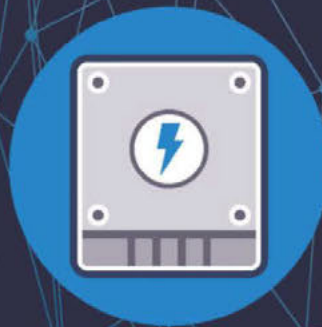


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Remembering...

Durell Software Ltd

This week, David Hayward looks at a classic 80s games company

I was recently on a Facebook page for fans of the ZX Spectrum, and I got into a conversation regarding the many wonderful games that came from the Durell Software Ltd stable.

Games such as *Galaxy 5*, *Starfighter*, *Scuba Dive*, *Harrier Attack*, *Saboteur* and many others – *Fat Worm Blows a Sparky*, anyone? As a software company, you could be sure that after spending your hard-earned paper round money, the Durell game that was clutched in your sweaty mitts was going to be worth every penny.

However, those classics we recall from the heady days of the Spectrum were a long way from the humble beginnings of the company. While we may remember *Saboteur* with a certain misty-eyed fondness, the people behind Durell didn't start off with the intention of entering the fledgling computer games market.

Its History

Durell Software Ltd was started in the early 80s, by Robert White and his wife, Veronica.

At the time, Robert was training to be an art teacher, but after a while he soon realised that this wasn't quite the direction he wanted his life to move forward in. To that end, he took himself back to college to train for a career in quantity surveying.

After some years, he qualified with a degree and ended up working for Milton Keynes District Hospital using the computer modelling skills he had attained while studying.

The hospital at the time was undergoing a huge renovation, and since he had a notion about the modelling software – and computers in general – his job was to help iron out the details. The hospital model had already seen several architects work on it, and things were a little confusing at first, such as kitchen units being placed on the ceilings. Needless to say, Robert was soon bored and saw an opportunity to start his own business in the newly emerging home computer industry.

Armed with a 48K Oric and an Epson printer, Robert started to create an assembler and use it to write *Harrier Attack*. As the project grew, he eventually saw the need to take on extra programmers, to design the game for different platforms. Mike Richardson and Ron Jeffs came on board at the company's attic room in Taunton.

The first game released was *Jungle Trouble*, a game that Mike Richardson was already halfway through at the time he started at Durell. After that came *Harrier Attack*, *Scuba Dive*, *Combat Lynx* and *Critical Mass*, with the likes of *Saboteur* and *Saboteur 2* being released when Clive Townsend joined.

The end of 1987, however, saw Durell selling off the rights to its games to Elite Systems and moving out of games development to financial software and services. In 2005, Mike Richardson launched Durell Games with *Harrier Attack 2* and now a collection of mobile casinos.

Interestingly, Durell still exists today and is still located in Taunton. These days the

Did You Know?

- Durell is pronounced 'dew-rel', in case you didn't know.
- According to legend, Veronica White wanted *Scuba Dive* to be played without guns (spearguns we imagine), so that's why you can't attack the fish.
- The Spectrum 4 compilation had *Harrier Attack*, *Scuba Dive*, *Jungle Trouble* and *Far Worm* all on one tape.

company creates office administration software for IFAs, mortgage and general insurance brokers.

The Good

Well developed and cleverly conceived games. A unspoken guarantee that a Durell game was going to be good.

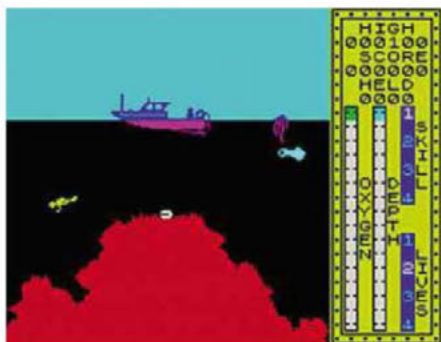
The Bad

Okay, so one or two games didn't quite live up to Durell's high standards. *Sigma 7* was good (in my opinion), but it did lack some of the polish we saw from other Durell games.

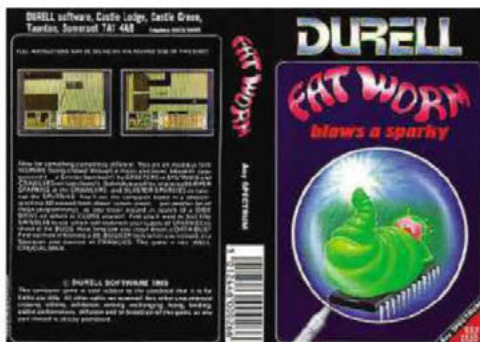
Conclusion

There we have it: a brief look at Durell Software Ltd and home to a sizeable chunk of our Spectrum gaming memories.

Thanks, Durell team, wherever you all are now. **mm**



▲ *Scuba Dive*, one of Durell's most popular games



▲ Any company that comes up with the name, *Fat Worm Blows a Sparky* must be good



▲ *Harrier Attack*, one of our all-time favourite Spectrum games

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Component Watch

Looking for a hefty storage boost? A mechanical hard drive is still the way to go...

A cheap mechanical hard drive is a great way to beef up your storage, even if SSD prices are dropping rapidly. It'll be a while before solid state hardware makes mechanical drives outright unprofitable, so you might as well make use of them while you still can. There's every chance the next mechanical drive you buy could be the last – especially if you pick a high capacity one. That's why we've dedicated this week's column to finding the best high-capacity storage drives at the best prices around.

Deal 1: Seagate Barracuda 4TB (ST4000DM000)

RRP: £123 / Deal Price: £100

Seagate make reliable drives at any price point and capacity, so that should make this one worth a little attention – especially since you get access to Seagate's DiscWizard software, designed to make upgrading to a large drive that little bit easier. A 64MB cache and 5900RPM speed are both lower than Toshiba's model, though, so if you're looking for speed over reliability or ease of use it may not be your first choice! Otherwise, go for it.

Where to get it: Expansys (bit.ly/20015Ng)

Deal 2: Toshiba X300 4TB (HDWE140EZSTA)

RRP: £115 / Deal Price: £106

The Toshiba X300 4TB drive is a 3.5" SATA-III drive that manages to combine a low power draw with high capacity storage. At £105, it's still quite cheap for a 4TB drive, but it has extra power and performance worth paying for over the cheapest drives you'll come across – including that 7200rpm spin speed. A 128MB buffer and 11.3 watt active power consumption are both pretty good for all-purpose drives of this size, so if you like the price there's nothing that should put you off picking one up to boost your system's storage.

Where to get it: Ebuyer (bit.ly/20015Ng)



Deal 3: Western Digital Green 5TB (WD50EZR)

RRP: £154 / Deal Price: £134

Western Digital's Green drives are optimised for performance and power consumption over speed, which is why this 5TB drive makes for an extremely attractive purchase – especially given the price point. It's actually a little more cost-effective than the 6TB version (which we'll look at in a moment) so if you're interested in high capacity at low cost, the 5TB version is the one to look out for.

Where to get it: Laptops Direct (bit.ly/1ouqt9n)



Deal 4: Western Digital Green 6TB (WD60EZR)

RRP: £200 / Deal Price: £180

The 6TB version of Western Digital's drives are some of the highest-capacity on the market, and while there are versions optimised for surveillance and NAS use, the Western Digital Green line is great for desktop users, with low power consumption and low noise levels but high speed access. And it comes with a two-year warranty, which suggests a reasonable level of confidence in the hardware!

Where to get it: Overclockers (bit.ly/20XwXvD)



Deal 5: Seagate Archive 8TB (ST8000AS0002)

RRP: £216 / Deal Price: £180

Cheaper, per GB, than some smaller hard drives, the Seagate Archive is the highest-capacity consumer drive on the market, and it's aimed at archival storage purposes (hence the name). It has a low 5900 RPM speed, so it's not intended for use as a main hard drive, but it's definitely worth picking up if you're looking for a way to hoard all of your data in one place – especially when the discount is this good!

Where to get it: Scan (bit.ly/20XwXvD)



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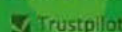
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GCHQ Puzzle Winners Picked

Facebook App Drains Phone Batteries?

iPhone and Android both affected, according to The Guardian

A report by Samuel Gibbs in *The Guardian* has concluded that the current Facebook app has a significant impact of the on the battery life of mobile phones.

Having looked at both Android and iPhone handsets, the newspaper's conclusions surrounding his research were pretty damning. First, Gibbs' wrote that a Nexus 6P mobile achieved 20% more battery at the end of a day's use without the Facebook app installed, noting that even when the app wasn't in use it was still impacting on both performance and battery life from behind the scenes.

Gibbs has now written that similar problems are present for iPhone users, after testing his theory on the iPhone 6S Plus for a week without the Facebook app installed. According to his research, uninstalling the app and instead accessing Facebook via the Safari browser led to a 15% saving on the phone's battery life. It wasn't just a one-off either as getting other iPhone users to carry out the same test proved beneficial to their handsets' battery life also.

Have you experienced problems with the Facebook app, or are you far too cool/busy for all this social media malarky?



Three came closest to completing the lot

Congratulations to Edinburgh's David MacBryan for being among the few to be named as winners of GCHQ's annual Christmas puzzle challenge. For the uninitiated, the challenge consisted of puzzles way beyond the kind you or we might typically spend our time completing; this was really high-IQ stuff, carefully put together by a team over a period of some months.

The first stage of the series of puzzles came on an official Christmas card sent out by the director of the GCHQ, where filling in various squares then eventually led to a QR code that took anyone

clever enough to get to that point to a website with the next stages in the challenge. In the end, David was among just three people named as winners of the challenge as they came closest out of over 600,000 people who attempted to solve the series. For their troubles, they won a GCHQ paperweight, a pen and a signed copy of *Alan Turing Decoded* (signed by Turing's nephew).

Oh, and in case you're wondering what it takes to be a puzzle champion, MacBryan was quoted in the press as describing himself as a 'professional puzzle master'. So, a full-time puzzle geek, then.



Did you manage to get hold of a Raspberry Pi Zero? If you did, then you're one of the lucky few (well 20,000, to be more precise). I, like most people, didn't get hold of one, and I've been regularly checking with stockists' websites ever since – to no avail, of course.

As disappointing as this is, it's important not to lose sight of what really matters: that I still have a Raspberry Pi 2, and there's plenty I can do with that.

Indeed, if you own any other model of this wonderful little system, then there's no shortage of projects you could try. And, as David Briddock shows us this week, there are some great add-ons you can buy to get even more out of your Pi.

Our options, then, are almost limitless. The only real problem is actually finding the time to do any of this...

If you're working on any interesting Pi-related projects, send us an email and tell us all about it.

Anthony

Editor

DOOM Coming Soon

May day for revamped shooter

The word 'iconic' is a label that has been stuck on many a game over the years, but we would venture that *DOOM* really does deserve it. As such, you may be aware by now that *DOOM* is making a comeback, thanks to the good chaps at id Software and Bethesda Softworks – and now we have a date for said comeback: May 13th, 2016. We're also told that the game will be appearing on PC, PS4 and Xbox One and that "demons, impossibly destructive guns, and fast, fluid movement provide the foundation for intense, first-person combat".

Hype like that, it has to be said, makes it a little bit hard not to get excited about this one.

The release will include a premium collector's edition that will include a 12" statue of the Revenant, which has been modelled from actual in-game 3D files, plus it comes in nice metal case. Pre-orders of this or the standard edition will also get access to the Demon Multiplayer Pack, which contains a bunch of armour sets, skins and multiplayer match consumable perks. Costing £100, you'll have to be pretty keen on your *DOOM* to pick this particular edition up, though, but you can over at www.DOOM.com.

Meanwhile... On The Internet...

Before Christmas we covered the scary VTech hack that had seen four million-odd accounts and over six million children's profiles compromised (tinyurl.com/MM1401a), apparently revealing names, addresses, IP addresses, dates of birth, genders along with user's secret questions and answers and even a significant amount of photos. According to *Motherboard*, which was tipped off about the hack by a person claiming responsibility, VTech was unaware of what was going on inside its servers before being notified by the magazine (tinyurl.com/MMnet92e). Indeed, it had done little to ensure the details were secure. For example, the passwords were only protected (or 'hashed', to use the parlance) with the MD5 algorithm, which is not considered all that much of a problems to crack.

In a pretty damning blog at the time (tinyurl.com/MM1401b), security commentator Troy Hunt, the man behind hack resource haveibeenpwnd.com (tinyurl.com/MM1401c), put it in the following stark terms:

"When it's hundreds of thousands of children including their names, genders and birthdates, that's off the charts. When it includes their parents as well – along with their home address – and you can link the two and emphatically say "Here is 9 year old Mary, I know where she lives and I have other personally identifiable information about her parents (including their password and security question)", I start to run out of superlatives to even describe how bad that is."

While arrests have since been made in connection with the breach (tinyurl.com/MM1401d), the fallout continues to affect the company. Not only did people have some serious questions about how this was allowed to happen, but it also attracted anger from parents who bought Christmas gifts that now did not function properly because VTech had suspended the compromised services (tinyurl.com/MM1401f). And there were also calls to outright boycott VTech products due to fears about exactly how sensitive data concerning minors is being handled by the Taiwanese firm. And none of this has been helped by recent changes to the firm's terms and conditions (tinyurl.com/MM1401g).

While it was in process of bringing the suspended 'Learning Lodge' services back online, VTech moved to amend its T&Cs in order to shift the liability for any future data breaches away from itself (tinyurl.com/MM1401h) – essentially saying that users give it their data at their own risk.

There's one potential fly in its ointment, though, and it comes from the UK Information Commissioner's Office, which is already investigating the November breach of VTech's services. It assured our colleagues at IT Pro that "The law is clear that it is organisations handling people's personal data that are responsible for keeping that data secure." (tinyurl.com/MM1401i). So there.

Following up on another story we've covered a number of times over the last few months, we will now come back to the Investigatory Powers Bill (aka the Snooper's Charter) and the report of the Commons' Joint Committee into the controversial proposals (tinyurl.com/MM1401j). For those not willing to trawl through the report's 198 pages, the response of the committee could be best characterised as 'mixed'.

For example, it acknowledged the need for our authorities to be able to access the encrypted data of suspected terrorists and criminals. But it also explored the Home Secretary, Theresa May, to clarify that the government would not demand that companies install backdoors in encrypted software to afford them access on demand. Similarly, it acknowledged the case for the euphemistically labelled 'targetted equipment interference' (aka the hacking of hardware). Yet it also noted that the current proposals needed to be better defined in terms of scope. It also struck a similar on-the-fence tone over the collection and storage of internet usage records, stating that the scope of the proposals, along with many technical aspects, needed to be better expressed. One point on which it was absolutely clear, however, was that it was wrong to allow UK authorities to ask foreign surveillance organisations to undertake spying that it itself is not permitted to.

All in all, the influential committee made 86 suggestions for possible changes to the bill. This pleased many (tinyurl.com/MM1401l) but left others, like ex-Deputy Prime Minister Nick Clegg (and *Micro Mart*), still wary of the extended powers the bill would afford law enforcement and spy organisations. Indeed, *The Verge* characterised the report as a rubber stamp for collecting our internet records (tinyurl.com/MM1401n), rather than as critical of the bill. This is now the third report from various Commons committees that has suggested significant changes and better definitions with the proposed legislation. The pressure is now on the Home Office to amend the details in order to ensure it goes through parliament despite the relatively small Conservative majority.

Aworrying BBC report, which appeared as we were putting this column together, has highlighted the use of Facebook by paedophiles. It seems that private groups within the social network are being used to share indecent and questionable images of children (tinyurl.com/MM1401p). The report also calls into question Facebook's systems for, and commitment to, removing inappropriate content. Indeed, it appears to highlight a laxity in its 'Community Standards' (tinyurl.com/MM1401r) by revealing that certain groups and material it reported were not removed.

.AVWhy?

Videos For Your Eyes...
Not Necessarily For Your Brain

This part of the magazine is always ready and waiting for the arrival of a new OK Go video, so this week we hand over a prime patch of *Micro Mart* real estate to the band that has done more for highly choreographed dance routines in indie music than any other. Despite setting the bar ridiculously high over the years (www.youtube.com/user/OkGo), the LA-based four-piece have vaulted it yet again with the Zero-G antics of their new clip for the aptly named song *Upside Down & Inside Out* (tinyurl.com/MM1401s)



Caption Competition



"If you think this is big wait till you see the power supply."

These busy bees were the subject of 1399's caption competition, and here are your best suggestions...

- **BullStuff:** "Intel begin using genetically altered employees."
- **Sawboman:** "I was sure the satnav said this was the landing spot."
- **Sawboman:** "Darn these computer cafes, I said reduced portions of chips not reduce us on a chip."
- **doctoryorkie:** "The core is exposed... AAAAGH!"
- **Martin Prince:** "So... If we dig here, we should get to the core pretty easily."
- **Mad Malc is back:** "Testing motherboards is child's play. What's that? Yours doesn't work, I wonder why?"
- **The Duke:** "I'm sure this pic has been used before."
- **Think Tank:** "Nano manufacturing process revealed."
- **wyliecoyoteuk:** "One day, all this processing power will fit in a device so small that you can carry it in your pocket"
- **Thomas Turnbull:** "There are issues about the size of our new supercomputer, we need to shrink it down a bit."
- **Ondrive:** "It's always the same: three blokes standing around, nothing getting processed!"
- **Thomas Turnbull:** "We confused nanometers with millimetres and ended up with this."
- **Mal T:** "Blimey - the green men got here before Kilroy."

Thanks for all your entries, and congratulations to our winner, regular contributor Thomas Turnbull, who came up with the table-turning "If you think this is big wait till you see the power supply."

If you have something to say about the picture below (come on, you must have), head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), or email us your funnies via caption@micromart.co.uk, remembering to add the issue number to the email.



Microsoft Buys SwiftKey

Predicting big things for future portfolio?

London startup SwiftKey is now under the control of Microsoft with reports suggesting a payment of around £170m sealed the acquisition.

The popular predictive smartphone keyboard app is used by millions of devices over the world and it's easy to understand why Microsoft

would have been interested in such an acquisition. The app is popular, established and it harnesses impressive, intelligent technology – namely, artificial intelligence.

This is likely where the interest in this acquisition lies for Microsoft as it could potentially harness AI in other applications further down the line.

BlackBerry Makes More Cuts

When will this actually end?

Stop us if you've heard this one before. BlackBerry has announced job cuts in North America.

The 200 job losses will affect a manufacturing plant in Florida and employees at the corporate HQ in Ontario. While this is clearly a far lesser loss than that witnessed back in 2015, when thousands of workers were let go, it is a continuation of a

long-running theme of cuts for BlackBerry that suggests that it still has some way to go in its plans to "drive efficiencies".

What else does it tell us? Well, BlackBerry said in its statement on the matter that the cuts are all part of its ongoing turnaround strategy for the company. For the sake of whoever is left, we hope that turnaround is showing some signs of paying off.

 **BlackBerry®**

Snippets!

POTUS' Wi-fi "Patchy"

Even presidents have dodgy coverage, apparently. So, while you would have been forgiven for assuming that President Obama and his family would be used to the finer things in life, including an outstanding Internet connection, that's not the case. In fact, according to an interview the President gave to US TV channel CBS. The White House has "patchy" Internet coverage and Obama joked that he has been trying to improve matters in time for the next President to benefit.

Sale Award Search

The 2016 Tony Sale Award for Computer Conservation has been launched, recognising achievements in computer conservation or restoration. Open to any individual or group anywhere in the world, and managed by the Computer Conservation Society, the award was established in memory of the Colossus rebuilder. The closing date for nominations is June 30th, 2016 and you should visit www.sale-award.org if you have anyone you'd like to put forward.

Malware Archive Up

Have you ever thought it would be a great idea to set up a website showing off all of the malware from yesteryear? No, neither have we, but Mikko Hypponen has, and his idea has turned out to be quite a popular one. His online archive, The Malware Museum, contains emulated versions of viruses from the 1980s and 1990s so they're perfectly safe to view. You can join the hundreds of thousands of visitors to the site at archive.org/details/malwaremuseum and take a look at Hypponen's collection of his favourite viruses from that era.

You can even download your favourite and enjoy the crazy visuals with none of the harmful impact.

Fore!

Robot golfer scores hole-in-one

Golf is a curious game. Frustrating, time-consuming and sometimes a wee bit dull, it also remains extremely popular among videogamers – and has a history of dabbling in technology to help golfers raise their game.

Technology is rarely the headline story in golf, however... Until now. A robotic golfer has pulled off the mighty feat of scoring a hole-in-one at the United States' Scottsdale course,

which will be an instantly familiar course to anyone who has played PGA Tour at any point over the past decade.

Scored on the 16th hole, it took LDRIC (Launch Directional Robot Intelligent Circuitry) five goes at it in front of a crowd of 20,000 onlookers. The robot had a helping hand as it's controlled by a human and it was set up very carefully to make the shot.

Still, it's done something we've never managed to do. We're more than happy to stick

to the Sega Megadrive version of golf anyway, ta very much. Nice shot!

▼ A vision of golf's future?



BT Agrees To Boost New Build Broadband

Complaints lead to action

Last week we relayed news of a report at Cable.co.uk that suggested homeowners of new build houses were not at all happy with the poor broadband speeds they were kitted out with. Well now BT has announced that Openreach and the Home Builders Federation have come up with a plan to deliver superfast broadband to all newly

built homes, with over half of new homes being connected free of charge and the rest to be part-funded by home developers.

The chairman of the Home Builders Federation said of the deal that it would "see more new build purchasers benefit from the very best connectivity to go alongside the many other advantages of purchasing a brand new home". Well done to BT, the government and the HBF for

putting their collective wisdom together to make this happen.

BT has also said that the broadband outage that affected the whole of the UK in early February was down to a "faulty router" and that it was sorry for anyone affected by the outage. It has offered that old classic solution for anyone still experiencing connection problems: router reboot. Brilliant.

Beware This Amazon Scam

When something seems too good be true...

Thanks to Malwarebytes for the heads-up on this one. The security outfit has found a phishing scam in a fake Amazon email that informs the recipient that they have a chance to win a tenner if they complete a return a survey.

The full text, in case it swings your way, reads:

"As a valued customer we would like to present you with an opportunity to make a quick buck. We are offering £10 each to a selected number

of customers in exchange for completing a quick survey relating to our service."

In actual fact, the link sends users to a compromised home and gardens website, that is now down by all accounts. Malwarebytes doesn't want anyone to find themselves caught up in this murky world, so just be on the lookout.

There is also good advice from the company on looking out for a green padlock for any website that you're asked to log in or submit sensitive data to.

amazon.co.uk®

AMD Gets Its Thermals On

Processors too for near-silent performance

AMD has unveiled a range of new desktop processor thermal solutions promising great cooling.

The company's new flagship AMD Wraith Cooler, we're told, combines near-silent operation with unique styling – in the form of a sleek fan shroud and LED illumination. This ultimately gives over a third more airflow and a quarter more surface area for heat dissipation than its predecessor did, apparently.

These updated thermal solutions are destined to be included with seven new processors. Included in those is the AMD A10-7860K, a CPU

powered by four cores, each clocked at 4.0GHz when turbo boosted, alongside eight GPU cores with integrated Radeon R7 processor graphics running at 757MHz.

The processor also supports AMD FreeSync technology, promising to put "an end to choppy gameplay" by creating a tight integration with compatible screens.

Finally, AMD has also told us that its Athlon X4 845 processor will be the first to feature the "Excavator" x86 architecture technology. Specifically, that adds up to a quad-core CPU clocked at 3.8GHz. You can read more on all this at www.amd.com.

Fabulous Case From Phanteks

One for entry-level system builders

Phanteks has announced its Eclipse P400 and P400S (Silent Edition) cases. Built with entry-level system builders in mind, the Eclipse P400 appears to support a wide range of features for range of users and configurations. Cooling options are catered for with support for up to a 360mm radiator in the front, along with provision for two 140mm fans in the top and a 120mm fan in the rear.

It comes in white, grey or black with various configurations (window or non-window; with or without sound dampening) and it supports up to two 2.5" drives alongside two 3.5" drives, graphics cards up to 395mm and CPU coolers up to 170mm and PSUs up to 270mm. Also, an RGB lighting controller lets users manage the lighting on the front of the case.

Both the P400 and P400S are available to pre-order now from www.overclockers.co.uk.



Synology RT1900ac

Synology's first router makes advanced features easily accessible to the layperson via a sophisticated OS

DETAILS

- Price: £149
- Manufacturer: Synology
- Website: www.synology.com
- Requirements: A spare Ethernet port or wi-fi adaptor, a web browser.

Synology has long wowed the network-attached storage (NAS) buying public with its high-end consumer and professional NAS units. The units combine top-quality hardware and great features with a desktop-like operating system that makes the units easy to set up, administer and use. It's a real pleasure to use them, and you can download and install extra packages, such as web servers, media servers and content management systems, to extend the device's features.

Recently, Synology released the RT1900ac, an 802.11ac-compatible router that aims to use a sophisticated OS to make the router's often confusing and esoteric advanced features more accessible and usable to the wider public. This

sounds like a great idea. While router web interfaces have improved greatly over the last few years, there's still room for improvement, and a user-friendly, desktop-style user interface will hopefully encourage non-enthusiast users to try out features such as remote access to their network and attached storage. This new OS is called Synology Router Manager (SRM).

The router also packs a decent bit of power, thanks to a 1.2GHz processor and 256MB of RAM, and users can see the load of both within SRM. The RT1900ac is pretty well endowed as far as physical connections and controls are concerned too. There are four gigabit Ethernet ports, a WAN port, a USB3 port and an SD card reader. Controls are comprised of a power switch, a WPS button and a switch to toggle the wi-fi off and on. The RT1900ac also has wall-mount slots to help users place it in exactly the right spot for them. Alternatively, the slots can be used with a bundled stand to prop up the router.

Although the RT1900ac has an SD card reader, which is a most welcome addition and something not normally seen

on a router, many mid- to high-end routers have two USB ports. Two USB ports allow users to connect a USB storage device and a USB printer, for example, or two drives. Users may also want to use a USB wi-fi dongle as well as USB storage or a printer, and two USB ports would have allowed this. Hopefully, we'll see two ports on the next version.

The Synology RT1900ac is certainly full of high-end features. Some of it is what you'd expect from a good router. Users can set up port forwarding, for example, establish a DMZ and employ versatile parental controls to stop users from viewing unsavoury websites.

What separates the RT1900ac from other routers is the ease with which people can change options, view information graphically and even download new packages to add new features, just like they can with a Synology NAS. Indeed, SRM really is like a desktop operating system, and anyone who's used Windows, Mac OS or a Linux/Unix window manager will have no trouble getting to grips with it. Users can populate the desktop with their favourite apps and utilities, and arrange windows to suit their needs.

One of the utilities makes adding a USB drive a doddle, and once attached, the drive can be used with the Media Server app to provide DLNA-compatible clients, such as smart TVs and PC-based media players, access to music, photos and videos. Network users can also access attached



Distance	Synology RT1900ac	AVM Fritz!box 7490
2.4GHz		
One metre	81.3	69.9
Eight metres	76.3	57.6
15 metres	29	9.2
5GHz		
One metre	133.2	142.5
Eight metres	114.8	139.8
15 metres	16.6	13.7



storage through Windows' File Explorer, and configure user accounts to grant different levels of access to users.

Accessing the router when out and about is

In effect, FileStation and a QuickConnect account turn the RT1900ac into a user's personal cloud storage system. Power-users can configure the RT1900ac to

“ **Accessing the router when out and about is delightfully simple** ”

delightfully simple, thanks to QuickConnect. Users create a Synology QuickConnect ID and then access the router remotely using apps such as DS router, which lets users administrate the RT1900ac, and DS FileStation, which lets mobile users access their files when out and about.

cooperate with dynamic DNS services too, should they prefer.

We tested the Synology RT1900ac using a laptop with a D-Link DWA-182 802.11ac wi-fi adaptor and compared the RT1900ac's performance with that of an AVM Fritz!box 7490.

The Synology RT1900ac gave a decent performance on the 5GHz-band for an 802.11ac router, but it lacked the excitement I'd hoped for. The RT1900ac achieved average data transfer rates of 133.2Mbps at one metre, 114.8Mbps at eight metres and 16.6Mbps at 15 metres. In contrast, the Fritz!box 7490 achieved higher average data transfer rates of 142.5Mbps at one metre and 139.8Mbps at eight metres, and it wasn't far behind with an average rate of 13.7Mbps at 15 metres.

The RT1900ac's 2.4GHz-band performance was much better than that of the Fritz!box 7490, though, achieving an average data transfer rate of 81.3Mbps at one metre, 76.3Mbps at eight metres and 29Mbps at 15 metres. The Fritz!box 7490 achieved average data transfer rates of 69.9Mbps at one metre, 57.6Mbps at eight metres and 9.2Mbps at 15 metres in the same test.

I'd expected better 802.11ac wi-fi performance from the RT1900ac. It isn't the fastest router I've tested, but it certainly isn't the slowest. It's also worth emphasising that the 15 metre test is very difficult, as it's undertaken without line of sight to the router and with many obstacles in the way, so chances are good that you'll see higher speeds at other locations.

There are cheaper routers available, such as the TP-Link Archer C9 (£89.99, www.currys.co.uk), if all a user needs is 802.11ac wi-fi and four gigabit Ethernet ports,

but the Synology RT1900ac is for users who want much more from their router. The RT1900ac's rivals are the mighty Linksys WRT-1900AC (£179.99, www.pcworld.co.uk) and the Netgear Nighthawk R7000 (£144.99, Currys). The Linksys WRT-1900AC's OS lacks the sophistication of SRM, but the WRT-1900AC's firmware is designed to be customised and tweaked, making it a better choice for inveterate tinkerers. The Nighthawk is another fine router, but it again lacks SRM's accessibility, although I do prefer the Netgear Genie app to DS Router. The Nighthawk R7000 has two USB ports too.

However, if you want a router that works with you to achieve things, provides easy access to your network when you're out and about and has great NAS features, then the Synology RT1900ac is the router for you.

mm Andrew Unsworth

Sophisticated, feature-packed and user-friendly



Corsair Carbide 400C Case

Corsair delivers elegant styling and desirable features in the highly affordable Carbide 400c.

DETAILS

- Price: £79.99 (Overclockers)
- Manufacturer: Corsair
- Website: www.corsair.com
- Requirements: ATX system

Corsair's Carbide 600C case that I reviewed recently suffered from being rather big and having a slightly weird inverted layout. Neither of those points are an issue with the 400 Series design. It's more modestly scaled and also presents a conventional internal ATX organisation.

Like the 600 series before, this Carbide case design comes in two flavours; the audio suppressed 400Q 'Quiet' and the 'Clear' side panel 400C covered here.

Unpacking this case for the first time, I was struck by both the fine finish that Corsair had put on it, but also how compact

it is for a case that can take a full-sized ATX motherboard.

While the 215mm width isn't exceptional, a case that's only 425mm deep isn't one that a full ATX motherboard would typically fit. How does that work?

The answer was revealed when I tried to open the front fascia, and discovered that there wasn't a door, which then led me to the realisation that this case has no 5.25" external bays. No... not one.

This isn't a totally unique direction, as I think other case makers have already been there before, but this is the first time I've seen it in what I'd consider to be a mainstream targeted case design.

Once I'd got over that shock, I did begin to realise that by making such a radical choice, it allowed for some really interesting design choices elsewhere in the 400C.

Without bays, behind the fascia is free for fans or a water cooling radiator up to 360mm, if you first remove the 140mm fan included with the 400C.



The case also features a vented roof, so you can also mount up to a 240mm radiator. However, with the motherboard edge being rather close, you'd need to mount the fans on the outside, somewhat inelegantly. Or you could just rely on rising warm air to take more heat with it.

Alternatively, you could use two 120mm/140mm radiator assemblies behind the fascia and place roof fans to rapidly vent the heated air in the case.

Doing that would enable water cooling for both CPU and GPU(s) independently, providing an impressive option in such a relatively small enclosure.

With fans behind the fascia, there's a decent 370mm of clearance for a video card – plenty for most of the biggest designs.

One potential space restriction is that made available for the PSU, because it's enclosed in

Specifications

- Dimensions (L x W x H): 425 x 215 x 464 mm.
- Maximum GPU length: 370 mm.
- Maximum CPU cooler height: 170mm.
- Maximum PSU length: 190mm.
- Expansion slots: 7.
- 5.25" drive bays: 0.
- 3.5" hard drive bays: 2.
- 2.5" drive bays: 3.
- Cooling layout: Front: 3 x 120mm or 2 x 140mm (1 x 140mm included), top: 2 x 140/120mm, rear: 1 x 120mm (included).
- Radiator compatibility: 360mm: Front only, 280mm: Front only, 240mm: Front or top, 120mm: front, top, or rear.
- Dust filters on all intakes.
- Front I/O panel includes: USB 3.0 port (2), headphone and microphone jacks, power on and reset buttons..
- Two-year warranty.





plastic shielding designed to make the interior much less cable cluttered. You're not forced to use this part, and you can even remove the associated dual 3.5" drive bay and plastic cover if you have a massive shoebox-sized PSU to install.

There are three 2.5" trays that are on the other side of the motherboard shelf for SSD storage options, should you travel that path.

As I delved deeper into the 400C, the inescapable conclusion I came to was that this case is entirely about rapid air exchange and creating the best scenario for achieving that objective.

With the supplier complement of 140mm 'in' and 120mm 'out' fans, the case has a natural positive pressure. The obvious path out for air is through the roof vent, and you can obviously accelerate that by adding dual 120mm or 140mm fans there.

Both the floor and the entire front under the fascia has air filters, so drawing in plenty of cool external air and blowing it out the top will work well.

There's only one snag: there's no fan controller and, with no 5.25" bays, no obvious place to mount one. What



Corsair really needs to do is make one that fits in a 2.5" or 3.5" bay, which you can control via a spare USB header.

Other than that one point, and the culture shock of not having anywhere to put my optical drive, the 400C is a classy act throughout.

The side panel window provides both easy access and a great view of the internals, for anyone looking to show off their PC hardware. With lots of hidden cabling paths, a system can be shown in all its majestic technical elegance, rather than

appearing like something the Clangers constructed on an off-day.

And at £40 less than the 600C, the 400C and 400Q come at a price that most system builders can take.

The Carbide 400C is a very timely reminder that the era of 'half height' bays is done and dusted, and we should take a new system build as the welcome opportunity to move on.

Personally, for many PC scenarios, I'm sold.

mm Mark Pickavance

A terrific case without any external bays



Gear4 Soundwave

Cheap portable sound that resonates with our reviewer

DETAILS

- Price: £23.99
- Manufacturer: Gear 4
- Website: www.gear4.com
- Requirements: Bluetooth audio output device or 3.5mm jack audio

I recall the first Bluetooth speaker I reviewed in Micro Mart, and it cost north of £100.

These days, you can find them much cheaper, like Gear4's new Soundwave. It's one of many Bluetooth speakers Gear4 makes, but it's at the most affordable end of its extensive range.

While not exactly feature rich, the Soundwave contains the critical functionality that most people need in a highly transportable package. At just 22.5cm long, it's small enough to travel in a bag with a beach towel. And at less than 600g, it's light enough for prolonged summer treks.

That low weight is even more impressive when you realise that the Soundwave contains a rechargeable battery capable of powering it for up to six hours.

Outwardly, the soundwave is riffing on the theme of black. Gear4 used a soft rubberised coating to deflect some abuse, but how much is hard to determine.

The audio connectivity is either through Bluetooth or a 3.5mm jack that Gear4 provides a cable to use.

The only other accessory included is a USB micro-B cable for charging, as it assumes you have either a phone charger (or PC) for that purpose.

Using the speaker for the first time in Bluetooth mode, it

automatically enters pairing mode when powered up, and once connected to your phone/tablet, there are five buttons on the top that allow you to control the volume, pause/play and skip tracks. Obviously, if you use the audio jack, these buttons are entirely redundant.

In terms of sound, there are obvious limits to what two relatively small drivers and a passive bass structure can achieve. But unless you push the volume too high, it's relatively clean, if somewhat bass biased.

Gear4 seems coy about what the wattage output exactly is, though frankly it's enough to fill my office, and better than the audio I get out of most monitors.

As with most speakers using this tech, the Soundwave works much better in an outdoor environment than indoors, where the maximum range is often less than the quoted 30ft.

If you want the very best results, however, I'd use the 3.5mm jack, because the direct line input doesn't introduce any unexpected distortions into the audio stream.

These are Bluetooth technology issues and not anything intrinsically wrong with the Soundwave implementation, I might add.

My only criticism of the device is that the charge amperes are only 500mA as per a phone charger, where quicker

charging would have been available if it could handle the greater 900mA of USB 3.0 or the 1500mA that some tablet chargers can generate.

For this level of cost, I defy you to be disappointed with the Soundwave. It does what it says on the box, within the confines of the physical scale and technology used.

It comes down to how much you're prepared to pay and what you expect from wireless speakers. At this cost, these are actually better than I was expecting and in line with the majority of Bluetooth speakers costing up to three times as much.

mm Mark Pickavance

An inexpensive and portable way to boost phone audio



ShieldX2 Phone Case

Lightweight protection for when you drop your expensive phone

DETAILS

- Price: £59.95
- Manufacturer: ShieldX2
- Website: goo.gl/Q0DTX9
- Requirements: Virtually all models of phone covered, registration for Protection Promise

When it comes to choosing a case for your smartphone, you're normally spoilt for choice. But they're not always of the highest quality. We've seen some examples in the past that follow the original design of the phone but are next to useless when dropped or exposed to liquids. On the other hand, we've also seen phone cases that shroud the device in military grade combat gear, with extra toughened and rubberised areas.

While good, these more extreme cases do leave the device looking like a World War 2 field radio, rather than a high-end, modern smartphone.

Thankfully there lies in the middle ground a phone case that manages to keep your phone looking good, while still protecting it from damage. The ShieldX2 is a transparent case made from a mixture of toughened silicone and 9H tempered glass, so it's lightweight and thin. The case reviewed here is for a Samsung Note 4. A front and back silicone cover sits over the rear and edges of the phone, while still providing access to the various ports, camera and buttons. And a toughened glass section covers



▲ The silicon cover dampens falls to a solid surface from at least 4ft



▲ Fitting the ShieldX2 case is extremely easy

the phone screen (curved screens come with a PET foil screen protector too).

You also get an alcohol wipe, a set of alignment stickers and a dust removal sticker, as well as the fitting instructions and an activation code for the ShieldX2 Protection Promise. Fitting the case took mere minutes, with the alignment of the screen taking the longest portion of that time; it included wiping the screen with the alcohol wipe and removing the dust first.

After fitting the screen, we braved a few tests where we dropped the phone on a tiled surface from a height of around four foot. Thankfully, there was no damage to the phone, and surprisingly little damage to the silicon case too.

We also tried to score the screen with a screwdriver, and thanks to the toughened glass, the phone's original screen was left undamaged. It's also

worth noting that the ShieldX2's replacement glass screen was undamaged too, and with a quick wipe of a cloth, any blemishes were quickly removed.

The ShieldX2 comes with a 12-month Protection Promise, where any physical damage will be repaired for a small processing fee of £20 plus postage and packaging, and returned within 72 hours. This includes damage to the headphone port, touchscreen or buttons, as well as warping of the device and water damage. More details are available from the ShieldX2 site, and you'll need to make sure you register the case within 30 days of the purchase to qualify for the Protection Promise.

The ShieldX2 is a great protective case for virtually any phone available. Whether it's an Apple device, HTC, Samsung

or Sony, there's a case designed for the model and with it a sense of relief that your precious device is protected.

The Note 4 case we had for testing cost just £59.95, which is pretty good value considering the cost of the phone it's protecting.

mm David Hayward

Well-priced, and peace of mind for your phone



Asus VivoWatch

Is a smartwatch or a fitness tracker? Anthony finds out

DETAILS

- Price: £120
- Manufacturer: Asus
- Website: goo.gl/7rZHBR
- Requirements: Android or iOS device

So far, I'm yet to be convinced I need a smartwatch. The main reason I'd want one is for the notifications, because I often miss phone calls and messages when my phone is in my pocket. Having something that vibrates on my wrist to get my attention would be most welcome.

But that's not something I'm willing to pay hundreds of pounds for. Get yourself an Apple Watch, and you get all kinds of extras, but you also pay at least £300 for the privilege.

The Asus VivoWatch is less than half the price, though, so is it a more appealing prospect?

For a start, it's not a smartwatch in the same vein as the Apple Watch. Rather than being an all-singing, all-dancing wearable, it's more of a fitness tracker, and the features it has are proof of that. In the activity menu, you can track the number of steps you've taken, the calories you've burnt, total distance and total time – all based on readings from the built-in pedometer. You can also check your pulse rate, which the watch gets from sensors on the back.

Other than that, there's not much else, apart from an alarm function, a three-axis accelerometer and a UV meter. You can also get information about your sleep patterns, which is combined with your exercise data to generate a score on the 'Happiness Index'.



“ Somewhere between smartwatches and fitness trackers ”

All this information is entered into the mobile app, HiVivo (Android and iOS only). Without this, connected via Bluetooth, the VivoWatch is useless, but that's not an unusual requirement for a smartwatch.

In HiVivo, you can keep track of and share your activity. You can also use this app to see information about the watch itself, such as the battery percentage left, and the firmware version. The latter can also be updated here.

Finally, in HiVivo, you can alter a range of settings, such as

alarms, step and calorie targets, language and the watch face. You also sync with Google fit, sync to the cloud and set various parameters such as stride length. And you can toggle the movement reminder, message alerts, call alerts and vibration.

None of these things are particularly impressive, but they do mean the VivoWatch is more than able to do its job as a fitness tracker. If you're looking for more than that, though, then you'll be disappointed.

That's a shame, really, because it's not a bad-looking

device, with its simple oblong shape and metal trim. The screen might only be monochrome, with a resolution of 128 x 128, but the touch functionality is responsive and easy to use. The fact it's also IP67 water resistant is a bonus too. No doubt the charge time (one to two hours) and potential ten-day battery life will also be a big draw for some customers, as will the green LED on the face that lights up when you're exercising effectively.

But ultimately, the VivoWatch is trying to occupy a space somewhere between smartwatches and fitness trackers, and it doesn't excel at either. Its smart features are practically non-existent, and it's too limited as an exercise assistant to beat other fitness bands of a similar price.

That said, it's certainly competent, and the price isn't terrible. And its simplicity could actually be regarded as a plus point. If you're looking for media functions and fancy apps, look elsewhere, but if you want a fitness tracker that also looks good on your wrist, then give the VivoWatch a try.

mm Anthony Enticknap

Not bad but quite limited



Magix Fastcut 2016

Make more of your action video clips with the new Magix Fastcut

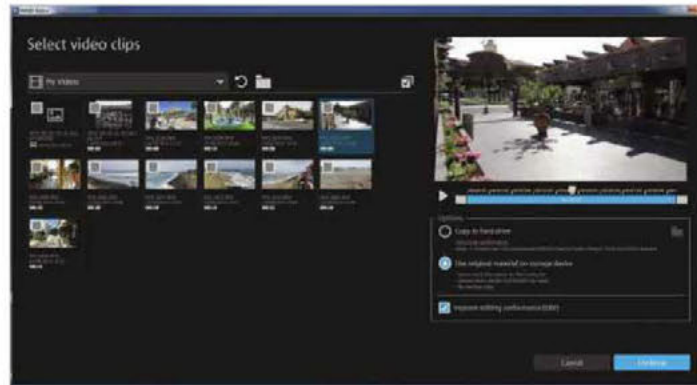
DETAILS

- Price: £ 29.99
- Manufacturer: Magix
- Website: www.magix.com/uk
- Minimum Requirements: Dual-core 2GHz CPU, 1 GB RAM, 2 GB disk space, Windows XP or later

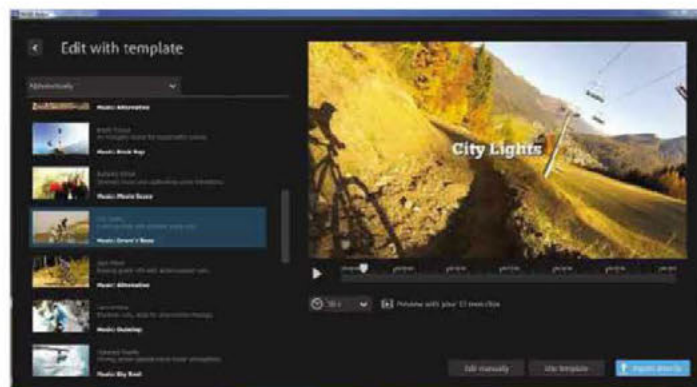
Just over a year ago Magix introduced Fastcut, a video editor designed specifically for editing footage from the fast expanding range of action cameras like the GoPro. It was basically an editor for people who didn't want to get too involved in the editing process, yet nonetheless wanted to produce something more than a string of raw clips downloaded from the camera. The idea was sound, although in practice the templates and format support were a little limiting; which I must say is unusual for Magix products.

This latest version addresses these limitations with pretty much more of everything. For example, the program now supports the majority of media devices, including smartphones, tablets, cameras and camcorders. That means it also supports the file formats common to these devices, including the popular AVCHD format.

Magix has also revamped the interface, providing better workflow, while optimising it to encompass the ever more popular touch displays. If you have a touch unit, it means you can now operate Fastcut with the familiar touch and swipe gestures, which again increases productivity. It seems that this is what this version is all about, because the new H.264 hardware-accelerated decoding reduces CPU load, so your editing is much slicker



▲ Choosing and inserting clips from different locations



▲ The program comes with a good range of templates

without the usual pauses while the computer catches up.

I find that sometimes these tweaks and enhancements are almost imperceptible, making very little difference to the actual performance of the system. Well, I'm happy to report that's not the case with Fastcut. Magix has done a remarkable job, because it feels like a completely different product. Part of this is due to using a low-resolution version of your clips while editing; the full resolution is only used at the output stage. While I'm on the subject of resolution, with this version, you can save your finished videos in up to 4K. You can also share them directly on YouTube, Vimeo or Facebook, or you can save them to suit iOS and Android mobile devices.

Primarily, the overall structure of the interface is unchanged, so current users won't have to learn it all over again. The major differences lie under the hood, so to speak, with new set length templates complete with music designed to automate the editing process. You simply choose the clips you want to include, select the length of the finished video, click continue on to the template screen and select a template; Fastcut does the rest. However, this is the no-frills approach, so naturally you need to make sure your video clips are long enough to cover the length you've chosen. Otherwise Fastcut has no option but to slow down the action with computer generated slowmo shots or repeat random clips to fit the template. The results using this method can be

disappointing; they're also affected by the type of template you choose. Yet to be fair it doesn't take long to understand what's required, and you have the option to choose a different length for the template or swap one clip for another. After that, you'll be turning out masterpieces like Spielberg.

As before, you can switch to manual mode at any time if you want to get more involved, but this unlocks the video from the template. I found it was quicker to go back and change the template for a new one, or change the timing to better fit the clips you're working with.

Like most Magix products, Fastcut includes a decent selection of theme-based templates, which come with effects, transitions and music to match your footage. I'm told that new templates will be added on a regular basis, and these updates are guaranteed to be free for a full year.

As usual, Magix offers a 14-day trial version on its website, combined with video tutorials to get you started.

mm Joe Lavery

**Makes short work of
your video editing**



GROUP TEST

Beginners' Linux Distros

It's a difficult to describe the impact Linux has had in recent years. Where once it was just a command line OS, for bearded technical commandos hammering away at keyboards, it's now inviting and relatively easy to use.

And to prove that, this week we've got six distros that should appeal to new Linux users.

Beginners' Linux Distros

Zorin OS 11 Core

DETAILS

- Price: Free for the Core version
- Manufacturer: Zorin
- Website: goo.gl/vimaau
- Requirements: 1GHz CPU, 512MB RAM, 10GB disk space

Zorin has been around now for some years and has been headed up by Artyom Zorin and his brother, Kyrill, since the beginning of the project.

The OS itself has seen many improvements over the years, but the emphasis is still on Linux beginners and, more specifically, new users who are coming exclusively from a Windows background.

The newest version to grace the download server is version 11, released in February. There are four different sub-versions to Zorin OS 11: Core, which is free and what we're looking at here; Lite, which wasn't available at the time of writing; Business, which obviously focuses more on a workstation point of view; and finally the Ultimate edition, which costs £9.99 and includes everything in the previous sub-versions, as well as a premium support package.

Zorin Core, however, is the starting point, and although it may look like the runt of the litter, it's actually as good a desktop experience as most other Linux distros.

This is an Ubuntu/Debian-based distro with a high degree of enhancements, which combine to offer beginners a far more relaxed desktop environment than some other distros. The desktop user experience is the most important aspect of Zorin 11, so it comes with a number of desktop apps such as a clock and calendar manager, contacts database, a world clock, various themes and the ever faithful Zorin Look Changer to further mimic the appearance of a Windows PC.

Since it's based on Ubuntu 15.10 and features the Linux kernel 4.2, there are some vast improvements over previous versions. There's better support for AMD and Nvidia GPUs, and more of the x86 assembly code has been cleaned up for overall system improvements as well as significant improvements in the file system. There's even support for games controllers, including those from Sony and Microsoft.

The installation of Zorin OS 11 Core is exceptionally easy. Once the 1.5GB .iso is downloaded, Zorin boots into a live setup environment – one

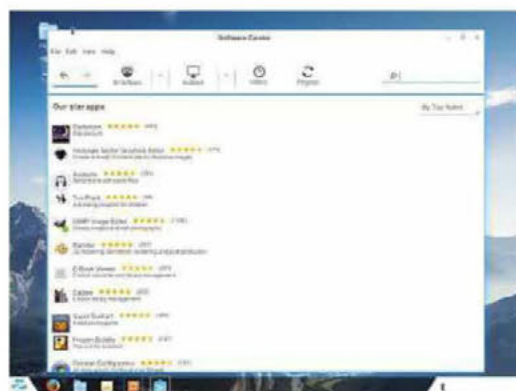
that's familiar with most Linux users. You can opt to try Zorin out, or you can install it, which doesn't take too long.

Booting to the Zorin desktop is quick, as is launching all the pre-installed packages. There's a good selection of programs to get you started with the likes of Firefox, LibreOffice, Wine, Gimp and so on.

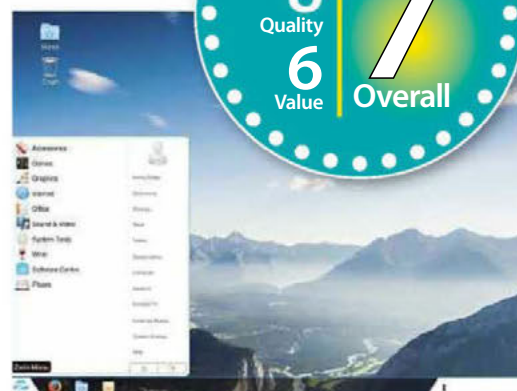
You can install other software packages via the Zorin Software Centre, which works in the same way as Ubuntu's Software Centre, but with the Zorin logo and recommendations throughout.

The only possible negative aspect to Zorin is perhaps its tendency to mimic Microsoft a little too much. While helping former Windows users ease themselves into Linux is commendable, the Zorin 11 desktop looks and behaves remarkably like Windows 10, so in many ways it's lost its Linux individuality in favour of looking like Windows.

It's a flimsy criticism, perhaps, but it's one that could turn users away as they become more experienced.



▲ Zorin OS 11 Core combines many resources for a decent beginners' distro



▲ The desktop is a little similar to Windows 10



Linux Mint 17.3 MATE

DETAILS

- Price: Free
- Manufacturer: Linux Mint Team
- Website: goo.gl/dmFwQ3
- Requirements: 1GHz CPU, 1GB RAM, 9GB of disk space

There's no denying the meteoric success that Linux Mint has enjoyed over the last few years. From humble beginnings, this particular distro has become one of the most appreciated versions of the operating system.

The latest version is 17.3, codenamed Rosa, and as you would expect from a modern distro, it comes in a variety of different desktop environments.

The version we have for this group is MATE, a branch from the older GNOME 2 project code that's generally regarded as being one of the most stable DEs available. Other desktop options though include Cinnamon, KDE and Xfce.

Version 17.3 is built on the Ubuntu 14.04 LTS base, and rather than concentrating on cutting-edge features, the team has instead focused on a more stable and polished desktop experience.

It's based on kernel 3.19 (with 4.20 available for update in the repositories), and you get LibreOffice 5 and support for touch devices – especially on the login screen, where visual improvements and an on-screen keyboard are now present.

There are various bug fixes too, with Nvidia GPUs in mind, as well as support for UEFI and non-PAE processors. Also, there are some improvements to the



▲ Linux Mint 17 is one of the best beginners distros available



▲ There's plenty for new users to get to grips with

“ For new Linux users,
Linux Mint is an excellent
choice ”

Application Menu, and there's support for more window and compositing managers.

MATE 1.12 sees some stability issues corrected, and there's better support for multiple monitors, multiple battery powered devices and fixes for screen problems when videos are being played.

All in all, it's a good release, and with Mint 17.3 combining all these improvements and fixes, the team has made a better environment for beginners to start with.

Speed certainly isn't an issue with the machine we tested Linux Mint 17.3 on.

Although it's not quite as fast as Zorin, booting to the desktop was pretty quick. Just to note, though, Mint 17.3 didn't boot to the desktop as fast as Windows 10 on the same machine.

For new Linux users, Linux Mint is an excellent choice. It manages to retain the look and feel of Linux without sacrificing its visual appearance to mimic Microsoft. Although you can change the desktop any time you like within Linux, users don't necessarily feel they're using a beginners' Linux even after several months of experience have gone by.

This makes Mint 'feel' like a distro that can grow with you easily, and thanks to the active community, there's always someone who can lend a virtual hand if you have any problems.

In short, Linux Mint 17.3 is one of the best and most polished distros available, for both beginners and more advanced Linux users.



Beginners' Linux Distro

Elementary OS

DETAILS

- Price: From \$5 donation, but you can opt for free download
- Manufacturer: Elementary LLC
- Website: goo.gl/K66a5m
- Requirements: 2GHz CPU, 2GB RAM, 15GB disk space

Elementary OS originally started life with version 0.1 Jupiter, which then moved on to 0.2 Luna and now the latest release, 0.3.2, codenamed Freya. This appeared in early December 2015 as a bug fix for the previous 0.3 version of Freya.

The distro started out as a project to create an amazing-looking set of themes for Linux. Since then, the team has upped its game and developed a number of programs that are focused on simplicity and beauty. The result is long regarded as one of the most eye-catching distros available.

Elementary is based on Ubuntu 14.04 LTS, so it's a familiar system to those who may have dabbled with Linux in the past, and it offers the first timer a good base to start from.

In terms of looks, it's a mixed bag. There are elements of Windows, Mac OS X, GNOME and Xfce, as well as a sprinkling of Android and Chrome OS, but it somehow manages to combine all these themes into a single, user-friendly distro that works surprisingly well.

Elementary's desktop looks fantastic, and the OS-X-style dock along the lower portion of the screen would



▲ Elementary OS certainly looks good



▲ It lacks productivity programs, but they can be added, of course

perhaps please Mac users. Windows users who aren't familiar with a dock might take a moment or two to get to grips with it, but on the whole it's a relatively easy way of opening and managing installed programs.

The pre-installed programs worth mentioning cover most average computing uses: Midori for web browsing, Geary as the email client, Shotwell for image and photo management, and Totem as the movie player. But for reasons unknown, there are no office or productivity programs. Adding programs is

easy enough via the Software Centre, but it would have been better to have a word processor, at least, installed by default.

While it may look pleasant and work reasonably well under modest hardware, Elementary does suffer from its own simplicity and beautification. Where the likes of Mint made good use of a traditional menu, of sorts, the dock and small set of applications can leave new users with no idea of where to go next. It's all fine and well keeping everything neat and tightly packed into

a small space, but considering this OS is being hailed as a great starting point for beginners, it doesn't do a great job of introducing them to Linux as a whole.

Those who are willing to delve more into Linux will no doubt tire very quickly of Elementary. While its simplicity is good, it's just a little too simple to keep users interested for long.

With a little work, Elementary would indeed be a wonderful way for Linux beginners to start their journey, but right now, there just isn't enough here to recommend it.



Sabayon 16.02

DETAILS

- Price: Free
- Manufacturer: Sabayon Promotions
- Website: goo.gl/es3DC0
- Requirements: 2GHz CPU, 2GB RAM, 15GB disk space

There have been many different versions of Sabayon over the years, and the current version, 16.02, is a major release for the distro. It fixes many previous bugs and performance problems while improving the stability of the core OS. But is it right for beginners?

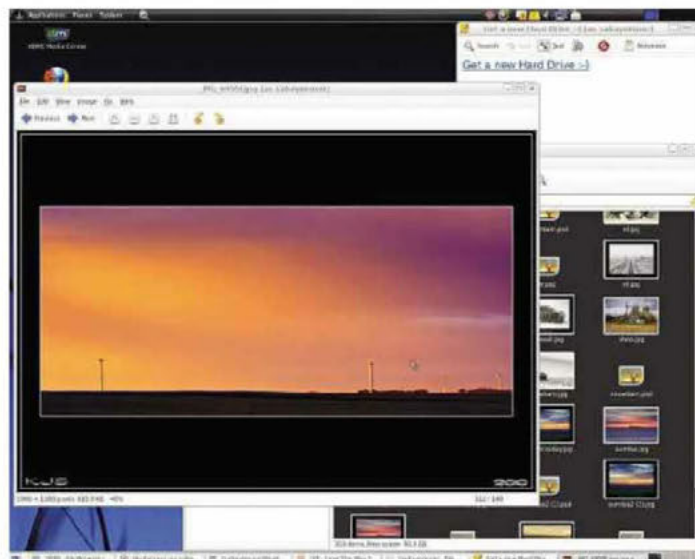
Sabayon is based on Gentoo Linux, another distro that follows a rolling release model. There are several desktop environment versions to choose from: KDE, xfce, MATE and Gnome 3, which is the version we're testing here. There's even a server edition for advanced users or businesses.

Sabayon is easy enough to install using the Sabayon Installer GUI, and it offers more advanced users the chance to alter their hard drive format tables and so on. New users shouldn't have too much difficulty with the installation either, as it's fairly well laid out and explained. Sabayon installed perfectly well on the machine we used for testing, but for some reason the sound refused to work after a reboot.

Once installed, Sabayon is a reasonably quick distro and fairly responsive. The Gnome 3 UI can take a little getting used to, especially when you take into account the top-left hot spot and



▲ Sabayon is a quick and responsive distro



▲ Although we lost the use of the sound, it worked well

“ Sabayon is a reasonably quick distro and fairly responsive ”

other such nuances. However, it's not too difficult, and the clean interface makes for a refreshing change from the usual Windows-esque desktops that most beginner Linux distros tend to lean toward.

The preinstalled programs for Sabayon include the latest LibreOffice, Chromium, Gimp,

Wine, Totem and even XBMC – into which you can boot Sabayon as a media centre, should you so wish.

Updating the programs and installing new ones can be done in several ways. Entropy and Portage are both package managers, but Entropy is the one specifically designed for Sabayon, and it can be used

via the GUI program Rigo Application Browser. Rigo is a pretty good package manager; it's easy to understand, offers you plenty of prompts in a friendly manner and walks you through the process of searching, installing, removing and updating any extra programs. Plus it does the same when it comes to applying the rolling updates.

And if you wish to delve further into Linux, there's plenty of opportunity to do so. The Sabayon website is full of useful information, and the community itself appears to be helpful, especially to new users.

Sabayon is a great distro for beginners. Granted, the Gentoo-based structure may be slightly different to anything they've used before, if they've used Debian or Ubuntu-based distros in the past, and Gnome 3 may appear a little odd at first, but that's not to say Sabayon is bad.

The only major problem we had was the loss of the sound functionality, which we never managed to get working. Although we can't comment on every possible installation, it could be the one thing that sways a new user to another distro.



Beginners' Linux Distros

Xubuntu 15.10

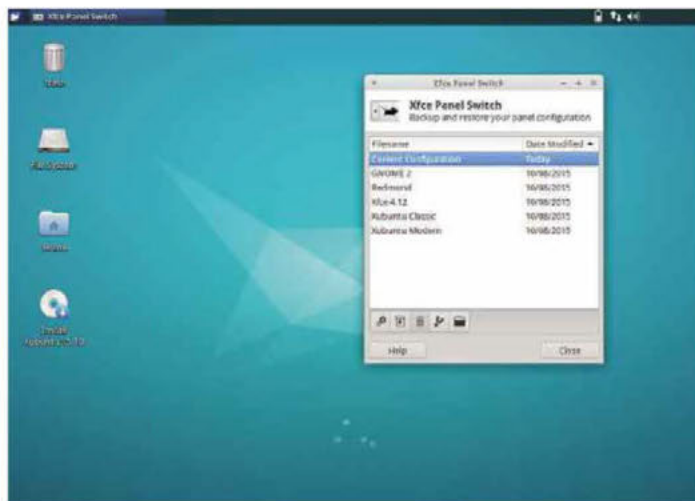
DETAILS

- Price: Free
- Manufacturer: Xubuntu Team
- Website: goo.gl/Edcv10
- Requirements: 1GHz CPU, 512MB RAM, 6.1GB disk space

Xubuntu is a spin-off of Ubuntu, which in itself isn't a bad thing, as the base is a reasonably stable one to work from. It's fast, easy on system resources, looks very good and, more importantly, is quite easy to use.

Now in version 15.10, this Xfce 4.12 distro has a lot going for it, from the point of view of beginners. For starters, being a lightweight flavour of Linux means it can be successfully installed on a more modest system and, what's more, as opposed to its KDE, Gnome and Unity cousins, it'll run reasonably quickly and be responsive enough for beginners to get to grips with and hopefully enjoy. It also works well under the likes of VirtualBox, if you want to test it out in a virtual environment before committing to a true installation.

The installation of Xubuntu is easy, taking the entire procedure from the now familiar Ubuntu installation manager and setup. Thankfully, it's a lot faster than the parent distro, which certainly goes a long way when being tested by beginners. And naturally, the more advanced options for drive formatting can be included, for those who wish a more controlled setup.



▲ Xubuntu is quick, light and a good start for beginners



▲ Using Ubuntu's Software Centre means it can grow with users too

users will be right at home with the layout, even though it's different to what they're generally used to.

The pre-installed programs include Firefox, Gimp, AbiWord and the Parole Media Player. Updating the system is done via Software Updater, which sits in the background listening for anything from the repositories, and which works without any problems once it finds something to update. Likewise, adding new software or removing anything is handled via the Ubuntu Software Centre or, for more advanced users, the Terminal command line. But generally speaking, beginners are well catered for when it comes to adding new software.

Xubuntu worked really well on our test machine. It's certainly a quick and sprightly operating system and, what's more, it's quite fluid in its use and is very easy to get to grips with. In our opinion, it's a good start to someone's Linux experience and will probably remain so for quite some time.

“ Beginners are well catered for when it comes to adding new software ”

In terms of looks and desktop layout, there may be a slight application of the brakes from Windows users when they first view it, because the 'start' button is located at the top of the screen by default. But it's a

well laid out environment, and finding the pre-installed programs and navigating around the system in general won't take too long. In fact, we're willing to bet that after a good half hour of toying around with the system,



Ubuntu 15.10

DETAILS

- Price: Free, but donations are accepted
- Manufacturer: Canonical
- Website: goo.gl/vWk8lr
- Requirements: 1GHz CPU, 1.5GB RAM, 7GB HDD free space

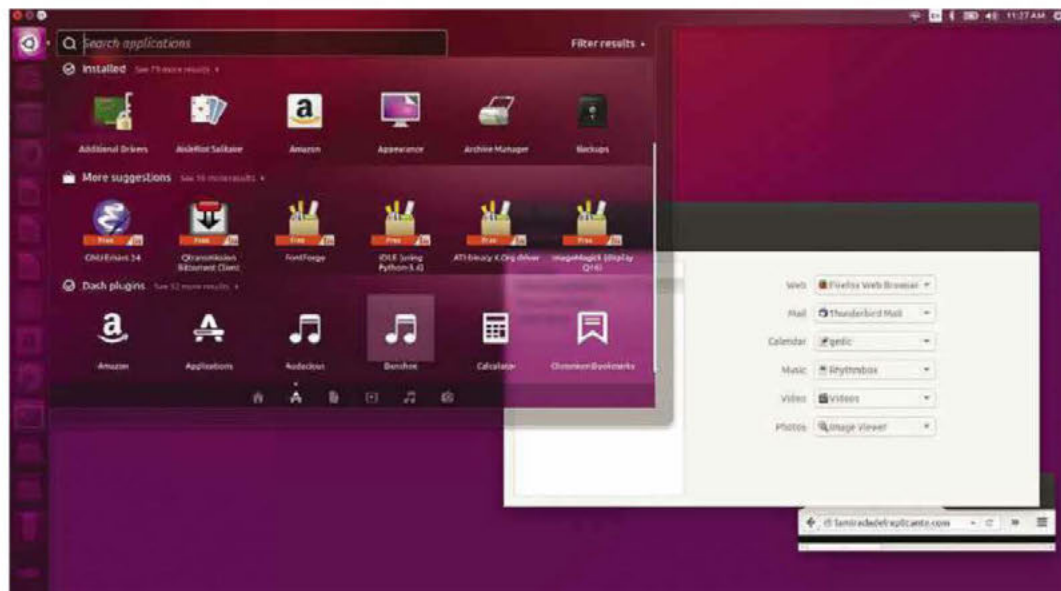
Say what you like about Ubuntu – and there's been plenty to speak of in the past – it's probably the one distro that has brought Linux to more non-Linux users than any other distro combined. While it's had its fair share of negative press, it is remarkably still the foundation Linux that a lot of users, even more experienced users, look to.

Now on version 15.10, codenamed the Wily Werewolf, Canonical's distro has taken a bit of a turn for the better this time around. This particular version hasn't included the usual experimental features that previous versions have in the past; remember Ubuntu One, Unity, Amazon searching...

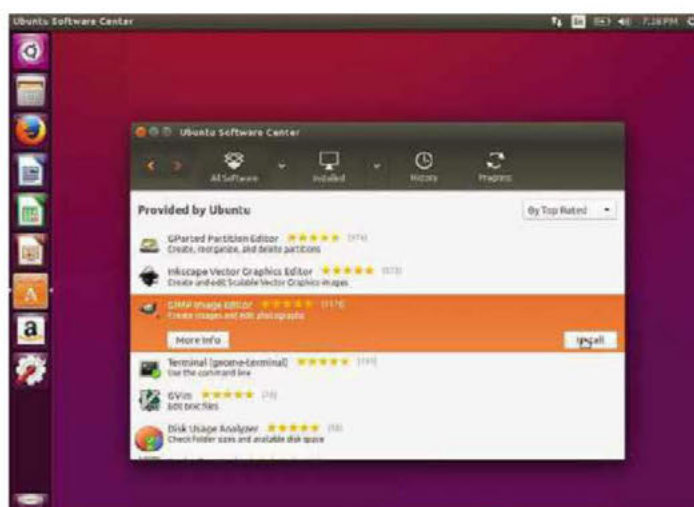
Instead 15.10 has opted for stability, performance and possibly a rebuilding of its user base before it launches the likes of Mir, Unity 8 and so on with the next release.

It's not without its new features, though, in terms of the core operating system. There's kernel 4.2, a few changes for Unity in the form of Compiz improvements and better integration with the MATE desktop. There's also Firefox 41, support for the Steam Controller and better support for the Steam Linux client when running in Big Picture Mode.

LibreOffice 5.02 is present, and there are updates for



▲ Love it or hate it, you have to give it credit for moving Linux forward



▲ For new Linux users, Ubuntu is a great start

Python and Ubuntu Make, the command line tool that allows you to download the latest updates for developer apps. There's even the latest version of VirtualBox, should new users need to return to a familiar Windows build within their new desktop environment.

The installation is the standard Ubuntu affair. It's easy to navigate, use and set up for first time users, although some elements could probably do with an update in the wording

– the choosing of the partition type section in particular.

Once installed, Ubuntu 15.10 worked perfectly well on the system we were testing it on. The core build is extremely stable and pretty quick once you get into using it. It is, however, the slowest Linux distro to boot to the desktop, although we're talking mere seconds apart here.

This version may not rock the Ubuntu too much, but that's a good thing from the point

of view of new users. It gives them time to get used to the environment before perhaps updating to the later version with newer functionality, look and feel. However, updating some of the features is simple enough, as is updating or installing any new package. With that in mind, we think new users will be quite at home with Ubuntu after the initial exploration of the environment.

Ubuntu 15.10 is a great distro for new Linux users to start with. It may not appeal to more experienced users, but it's able to evolve and grow with users as they improve their Linux skills.





Linux Mint

Linux Mint manages to combine all the elements of what makes Linux a great operating system, while still keeping the visual appeal of a modern desktop.

It's great for new users to learn from, and with them it'll evolve and grow as their experience does.



Ubuntu

Ubuntu is often the distro that the media and users love to hate. But you can't fault its push to get Linux into the mainstream.

For new users, Ubuntu is a perfect blank template to begin their Linux journey with. And it's a distro that they'll no doubt keep using for a while.

How We Tested

Each distro was tested on a PC with an Intel i7-4790K, 16GB of memory and a Kingston 250GB SSD. We also tested the distros on the same machine but within Hyper-V on a Windows 10 64-bit build with 4GB of RAM and a 25GB virtual hard drive. Each distro was the 64-bit edition.

	Zorin OS	Linux Mint	Elementary OS	Sabayon OS	Xubuntu	Ubuntu
Version	11 Core	17.3 Rosa	0.3.2 Freya	16.02	15.10	15.10 Wily Werewolf
Desktop Environment	Zorin Desktop Environment	MATE 1.12	Elementary Desktop Environment	Gnome 3.18	Xfce 4.12	Unity 7
Cost?	Free	Free	From \$5	Free	Free	Free
ISO size	1.5GB	1.6GB	1.15GB	1.4GB	1GB	1.1GB
Ideal For Beginners?	To some degree	Yes	To some degree	Yes	Yes	Yes
Good For Advanced Users?	Probably not	Yes	Not really	Yes	Yes	Yes

Top 5

Things That Are Worse On A Computer

Sometimes, the best thing is the real thing

1 Reading

Thanks to creation of E-Ink technology, we can now read digital books in a format that doesn't hurt our eyes or require a device that needs charging every few hours. However, when it comes to reading things on the web, most of us use either a PC, a tablet or a phone. And although there are some advantages to reading things this way, like scrolling and hyperlinks, it still doesn't beat reading a real newspaper, book or magazine (hint, hint). Not only do you suffer less eye strain, you also aren't kept awake by blue light, which messes around with your body's circadian rhythms. Also, unless someone's written in the margins, you don't have to put up with trolls in the comments section.

2 Board Games

Unlike videogames, where players all look at a screen and not each other, board games are a sociable activity, and they actively encourage people to engage with their peers. Take a board game and make it into a videogame, and it negates that entirely. But that's not the only reason board games are better in real rather than digital form. Another major factor is chance. In real life, you roll some dice and the result is random, each and every time. Ask a computer to do the same thing and you have a problem: without using external data from a natural source, computers can't generate truly random numbers. And another problem, of course, is that if you're losing at Monopoly on a PC, you can't have a stop and flip the board over.

3 Drawing

We've seen some amazing pictures created on iPads and other tablets. That's great, but it still doesn't beat a sketch pad and a decent pencil. Not only do you get the satisfaction of creating something tangible rather than a bunch of pixels, it's also much less fiddly. With a pencil, if you want a darker line, you press down harder. If you want a thicker line, you angle the pencil. Try doing that with your index finger on a touchscreen.

Of course, you could buy yourself a high-definition stylus or, if you're using a PC, a graphics tablet. That does make things easier and add a whole new dimension of creative opportunities, but it still just doesn't compare to physical media. That said, if all you can draw is stickmen, it probably doesn't matter either way.

4 Dating

Thanks to things like Tinder, online dating has become not only acceptable but perhaps fashionable. There are problems with the 'hook-up' nature of Tinder, but on the whole it's good that people have a way to meet each other.

Then again, the human race got along just fine for hundreds of years without having to swipe each other left or right. What happened to meeting people at work, at university or even out and about?

If you meet someone special via online dating, then we're happy for you. But in general, maybe everyone would be better off with more traditional ways of dating.

5 Sports

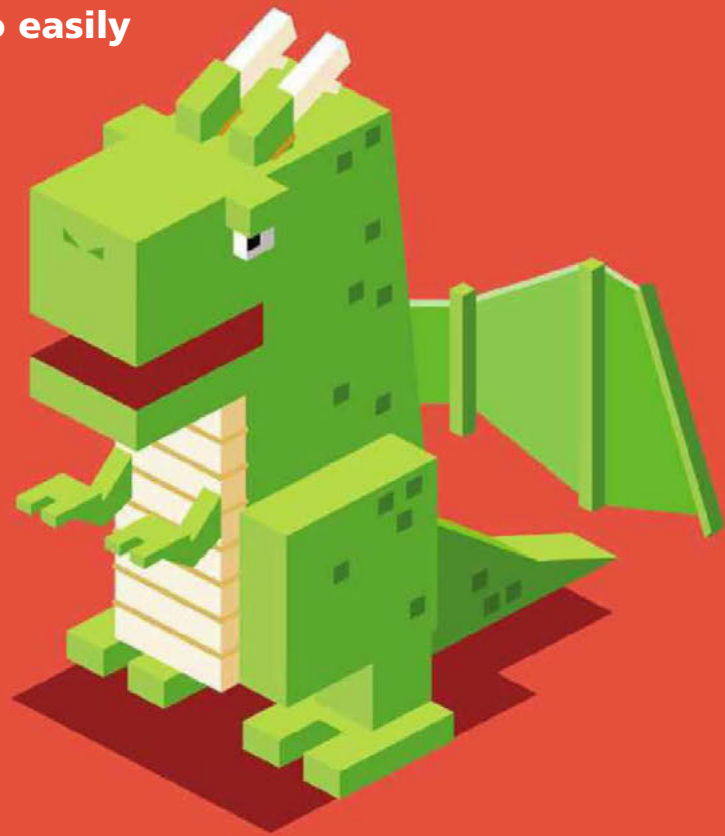
At a time when we're supposed to be in the grips of an obesity crisis and we're talking about a sugar tax, it's odd to think that professional sport, football in particular, is more popular than ever. Perhaps, though, that's something to do with the fact that many people would prefer to play a digital simulation of a sport than play it for real. EA's *FIFA* series sells in the millions, for example. Imagine if all the people who play it, instead of sitting and twitching their thumbs, actually went out and kicked a ball around. Sports games are fun, but the real thing should always be the preferred choice.



▲ If you're thinking 'Press circle!', you might need to get out more

Welcome to SketchUp

In the first part of a short series, **Mark Pickavance** explains how to use the amazingly powerful SketchUp Make to easily create 3D objects



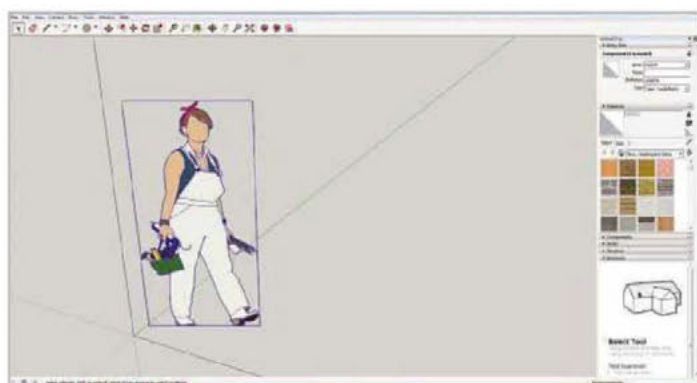
I've been using CAD (computer aided design) for a long time and have used many different applications over the years. Where most of them fall down is that you need to understand lots of quirky things about geometry, along with many nebulous concepts about the difference between actual 'data' and 'drawing'.

The different approaches software designers have taken over the years are almost as numerous as their tools, and they tend to alter them on a regular basis just to make using them even more challenging.

Good CAD tools can also be incredibly expensive, because they're used to design working products or buildings, and they need to be supported by highly skilled coders. They don't come cheap.

All these factors play into the general idea that CAD isn't for most people, because you need an engineering degree to understand it and use it.

I'd contest this position, because lots of people make objects either professionally or as a hobby, and they're not mathematics professors or direct descendents of Euclid. What these people need is a tool that anyone can pick up, and which, with a small amount of tuition, they can use to design things.



It might seem like a bold statement, but more than 30 years after I first got excited by CAD, I think I've found the perfect 3D modelling tool.

Called SketchUp, this is something that most people could be taught to use with a little perseverance. And to facilitate that, this is the first in a series of articles where I'll demonstrate how to use this remarkable tool and create whatever it is you want.

But before we start modelling, a little history.

SketchUp's Past

The story of SketchUp starts with a small company in Boulder, Colorado, USA, called @Last Software, formed in 1999 by Brad Schell and Joe Esch.

They set out with the idea of creating a modelling tool that gave designers the same level of freedom that paper and pen

“ Lots of people make objects either professionally or as a hobby ”

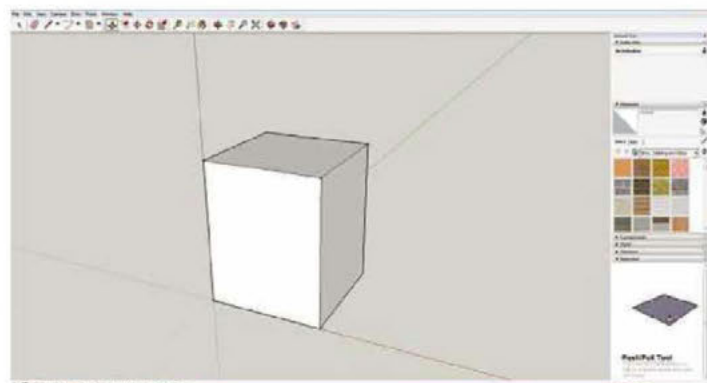
allowed them, but that would help them to create digital scale accurate designs. Within a year they'd launched SketchUp, and they immediately started to win software design awards for their innovative approach.

It wasn't long before Google noticed SketchUp, and promoted the tool by working with @Last Software to release a free version. This could be used to create models for incorporation into Google Earth and the Google 3D Warehouse.

Eventually, Google bought @Last Software, in 2006, and under its tenure SketchUp was expanded to include a presentation graphics module called Layouts. Layouts first appeared with SketchUp 6 in 2006, and this was followed in 2008 by version 7 and another two years later by release 8.

Google decided that it was time for SketchUp to be hived off in 2012, and it was sold to Trimble Navigation, the current owner.

The software is still being developed, with the 2016 version only just released. The basic functionality of the modelling tool has now been extended with a host of plug-ins, some created in house and others by third parties. Thanks to these extensions, SketchUp can render models as photorealistic images, make data suitable for 3D rendering, be used for kitchen design and more.



With many people now invested in using it, there's also a vast library of models in a free-to-access 3D Warehouse for those who need off-the shelf parts.

At this time, there are two versions of SketchUp available: one that's free and one that isn't.

SketchUp Make: Free to download and use, this version contains all the critical functionality for modelling. It's provided for non-commercial use, allowing anyone at home to download and install it at their discretion.

SketchUp Pro: Aimed at professional designers, the Pro release contains all the critical features for taking designs to the next stage. It includes the SketchUp Layouts app, which can make detailed drawings from model data. This costs \$700 to buy (£495), and you can optionally pay another \$120 each subsequent year to get continued support and upgrades.

Both versions are available for Windows and OS X, with some small differences between the interfaces in each.

There's also a free 'mobile viewer' tool for iOS and Android that allows Sketchup models to be viewed on those platforms, and there's even an online rendering platform called Kubity that enables the same functionality within a web browser.

Enough with the history. Time to get this software running.

What You Need To Start

For the following exercise, you'll first need to download and install SketchUp Make, which you'll find at www.sketchup.com/download. The web page will ask you if you intend to use it for personal, professional or educational use, and depending which you choose, it will take various details from you.

The executable installation file is about 124MB, and on most decent broadband connections, this should take a short time to download.

Understanding SketchUp

If you've ever used a 3D modelling tool before, forget almost all that detail right now. Because SketchUp doesn't work like any you've used, and that's actually a good thing I'd attest.

The whole thinking behind SketchUp is that designs are built through inferred connections, like a constructional toy. When builders construct a tall building, rarely do they make the roof first and then work out what should go under it later. In this respect, everything in SketchUp starts with a single, usually simple, shape from which the rest of the design is referenced and evolved.

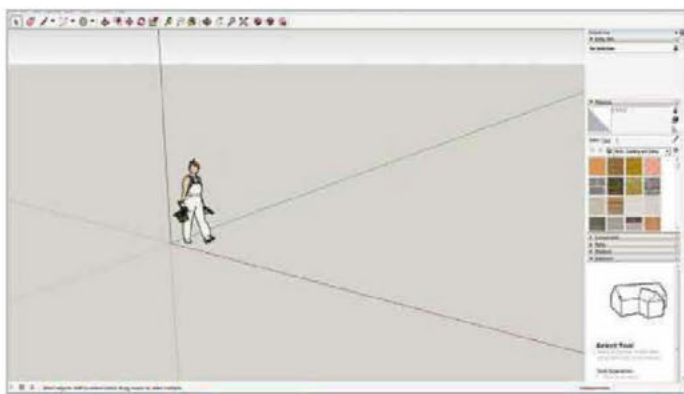
By taking this approach the model is anchored from the outset on a coordinate system that helps things fit together,

so you don't end up with holes where you don't want them or supporting structures that fail to connect.

When you first fire up SketchUp, it will ask you what template you intend to use, which sets the default scales and mode. Americans designed this tool and, like Isambard Kingdom Brunel, they think feet and inches are cool, so these are the default. Personally I'd pick a metric scale. You can change the default once you've started, and you can use any mix of imperial and metric while modelling, so it's not critical.

For this exercise, I'd recommend 'Architectural Design – Millimeters' (not my spelling choice, I might add), but if you want to pick another please do, and then click the button marked 'Start Using SketchUp'.

Your First SketchUp Model



As applications go, there isn't anything special here at first sight. You've got a line of icon tools along the top, an axis in the central area with what looks like a woman artist, and some supporting information over on the right.

What will confuse most CAD designers is that single view, because many of them will be used to seeing at least four views to enable them to model in 3D. Rest assured, one view is fine in SketchUp, because you can rapidly move it around.

Before drawing anything, this is a great time to familiarise yourself with the basic navigation functions that are inherent in the software. To use SketchUp well, you need a three-button mouse with a scroll wheel – something most PC owners should have. By default, SketchUp starts in 'Select Mode'.

In the default pointer mode, 'select', left-clicking can select an object, like the woman, or rubber band a rectangle to select multiple objects. Once an object is selected, the right-click generates a context menu, like most Windows applications do.

Rotating the scroll wheel zooms in and out, and it does so at the point in the model where the pointer is currently resting.

These are all in select mode, the first icon on the bar. There are two other movement tools much further down the bar – orbit and pan – but to use these you don't need the icons really.

To access orbit, just click the scroll button, then moving the mouse in combination rotates in 3D around the model. The final movement is the pan, and it works identically to orbit, except you hold the shift key down while using the scroll wheel and mouse movement.

What's great about these controls is that you can use them rapidly between other tools to reposition quickly. And there are also hotkeys you can learn to jump to specific view directions if you want them.

It's time to make an object, but first let's say goodbye to painter lady. Click on her so she gets a blue bounding box, and then press the delete key. You could left-click and erase her that way, or get that option from the Edit menu if you wish.

Our first object will be a rectangle, and it can be found on the shapes pull-down or by pressing the 'r' key.

At this point, the icon will become a red pencil with a box alongside it. Moving the cursor near the intersection of the red, blue and green lines will cause it to stick for a moment to that point, which is SketchUp showing that you can lock down one end of your rectangle there.

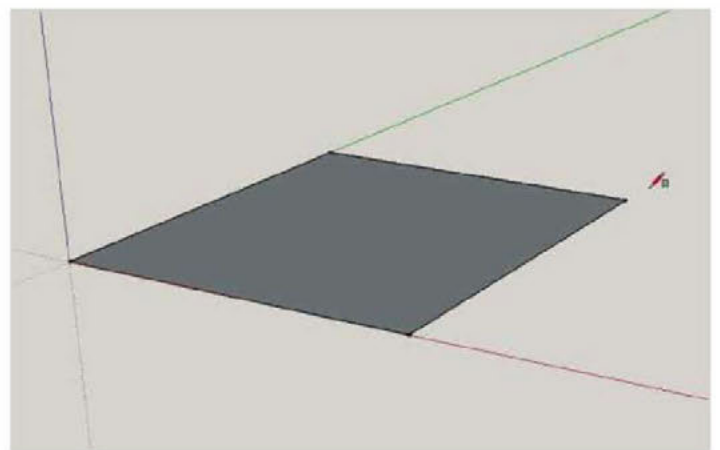
Clicking once on the origin will start the rectangle, and a final click will complete the shape by defining the opposite corner. You might notice the size of the rectangle in x and y is shown in the bottom right of the screen, and in this template that's in millimetres. You could specify feet and inches, even in a 'mm' template.

Press Ctrl+Z to delete that first try and start again, but this time just click once on the origin, and then enter '100mm, 100mm'. Unsurprisingly, you'll get a small 100mm square. And depending where around the origin you dragged, that's where the square will appear.

You could scroll into that to see it better, but instead select an icon that's near the orbit and pan tools, called 'Zoom Extents'. The shape will immediately fill the screen.

If you click in select mode on this object, you'll find it has an independently selectable surface and edges, so to get rid of it entirely you'll need to rubber band around it all and then press delete. Do that.

Now repeat the process, and create a square that's just 7.8mm, and zoom in so you can see it clearly.



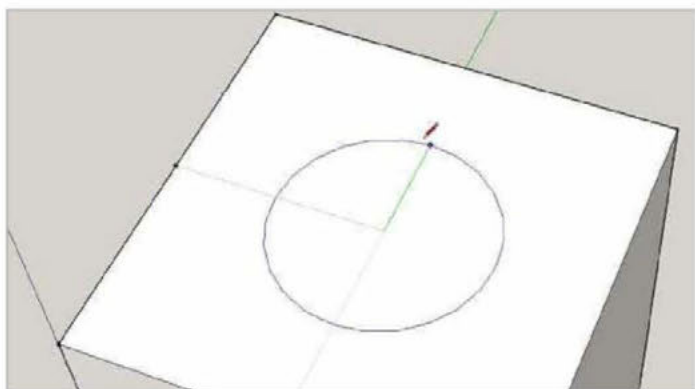
While a rectangle is nice, it's hardly 3D. What we need to do is to give it some scale in the vertical. The 'Push/Pull' tool can make our rectangle into a box very quickly, and in a very controlled way also.

After selecting the tool, you simply click on the rectangle or any side of any object, and then using the mouse you can extrude that side at 90 degrees to its plane.

And like the rectangle, before you click again to complete the change, you can enter a value for the move. Enter 9.6mm, and you have a small box.

Using orbit, rotate it over so you can see the top clearly. Now I want to place a cylinder on top of this box, right in the centre. To achieve that, we'll need the Circle that's on the Shapes menu where we previously got that rectangle, or you can simply press 'c'. The pointer becomes a circle that will orientate itself to the box whenever you're floating over it.

Before clicking, take a moment to hover around. When you touch a face, you get a label with 'On Face'. And equally the label changes when you have on an edge or corner ('endpoint'). What you need to do is find the midpoint, of the box top, where the highlight turns blue. But don't click!



Instead just move over the midpoint, inferring it, and then head towards the centre of the top face. A green dotted line should appear, and then when you reach the middle another red one should meet it from the other midpoint to give you the centre. Now you can click.

The next click will define the radius, but I know that for this part I need one of precisely 2.4mm, so I'd put that in directly.

You've probably guessed where this is going, but for those who haven't, you'll now need the push/pull tool and the critical distance of 1.7mm.

That completes our first simple object, a child's constructional brick of the simplest kind. But as I'll go on to show, SketchUp can take that simple model and do plenty with it.

Move, Copy And Modify

As you might reasonably expect from a Windows application, the usual cut-and-paste model applies to SketchUp, but there are variations on this that take into account the special aspects of 3D geometry. The first of these to master is the Move tool, because this allows you to duplicate parts rapidly and precisely. To demonstrate this, select both parts of the brick by rubber banding a line around them using select, so the whole item turns blue.

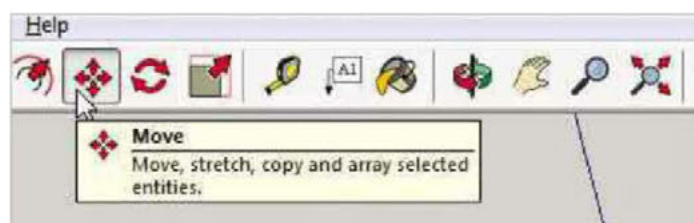
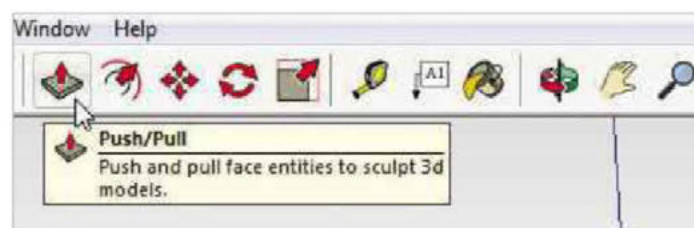
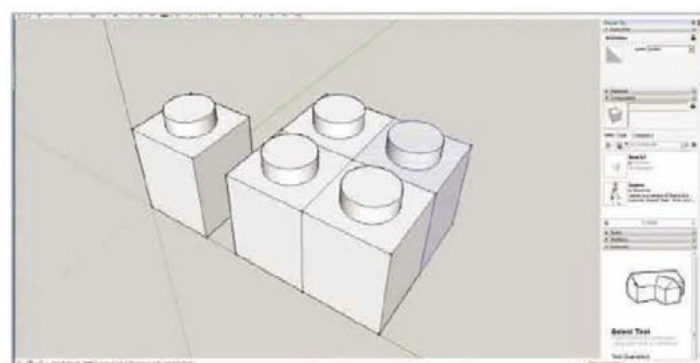
Then using the Move tool hold the control key down and drag a copy of the brick along the red axis. If you don't hold the Ctrl key, it will just move, so that part is critical. It isn't important how far you move it, other than you can clearly see space between them.

Going back to the original object, highlight it and then right-click and select 'Make Component...' I called mine 'Brick1x1', logically. What this does is combine the box and cylinder into a single object, one you can reuse multiple times in the design with very little overhead.

A component can be moved, rotated and scaled, though it retains the geometry of the original. You can edit a component by double-clicking on it, but it will change every instance of it.

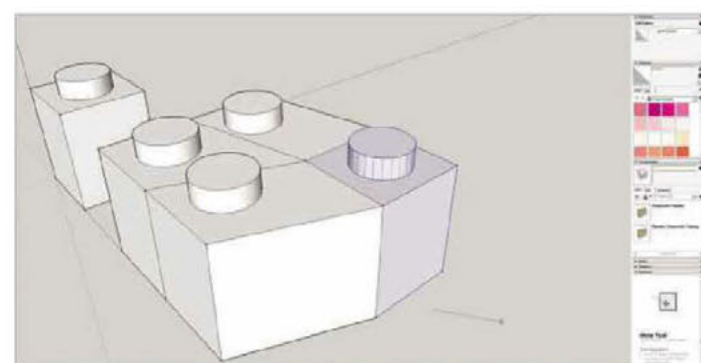
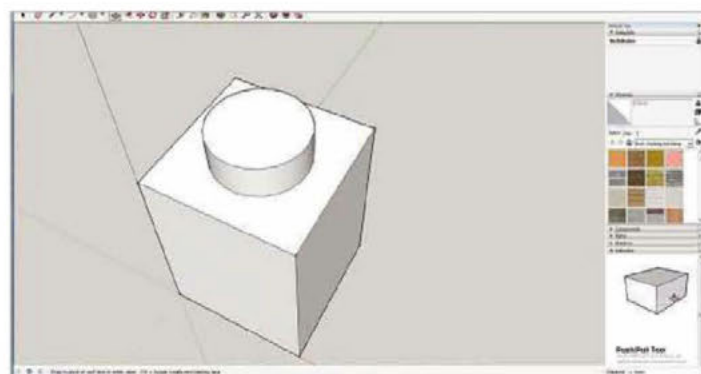
That's why I'm not changing the moved copy to a component, because I want to alter it easily.

Highlighting the second object that isn't a component, press Ctrl-C and Ctrl-V, and you'll get another one that you can place alongside it.



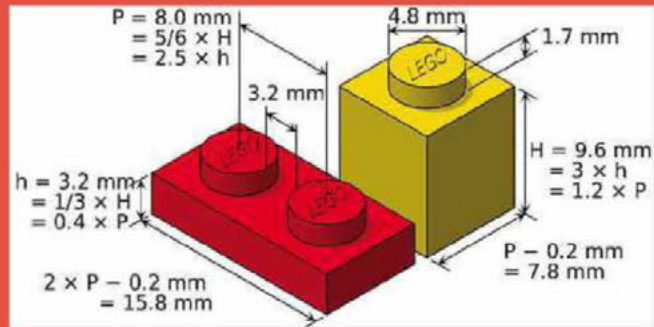
▲ The push/pull, move and select tools

“ Anyone with a basic understanding of scale and angles can learn to use SketchUp ”



Brick Sizes

I used this graphic I found on the internet as a reference for sizing basic bricks, but you could just get some and a Vernier scale to create your own measurements instead. Any similarities between my brick models and those used by Chinese dissidents is purely coincidental, I might add.



Snapping them together is very easy, because the default connect is an endpoint, and they're automatically attracted to each other.

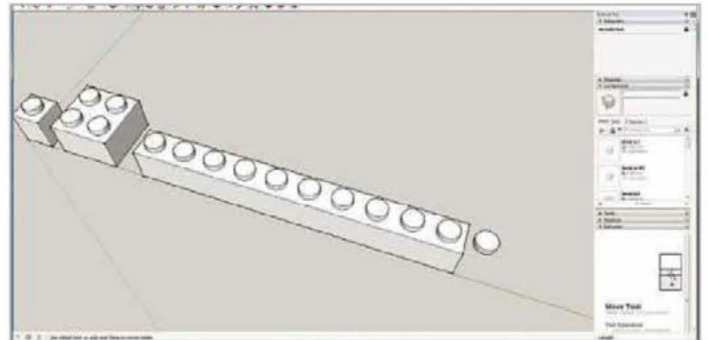
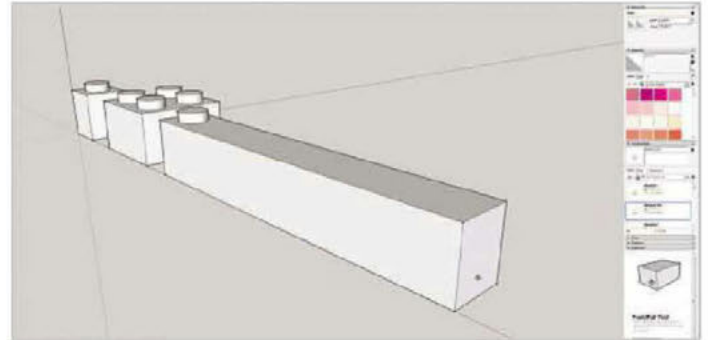
Once placed, I can use Ctrl-V again to make a third, place that, and again to finally a fourth. We've now made a 2x2 brick!

What's critical to understand is that as each of these blocks is placed alongside another, the system glues them together. Therefore, if you try to then move one away, you'll find it impacts on the touching geometry. This wouldn't have happened if I'd used the component version, but equally it has an important purpose when we want to make the 2x2 brick whole.

Looking down on the 2x2 brick, you want to select the Erase tool, and then click on the intersection of the cross on top. All those lines disappear, and the top becomes a single entity. Moving around the object, you can now remove all the excess edges until the brick looks like it was made in one piece to begin with. Don't forget the underneath. Obviously, you could create this design by other means, like the original part.

I now take that object and make it a component, called Brick2x2. I'd like to make more bricks of different sizes, but my original is a component, so how do I get the raw geometry back? Simple.

Copy the component or drag it off the component selector on the right, and then right-click on it and select 'Explode'. That breaks

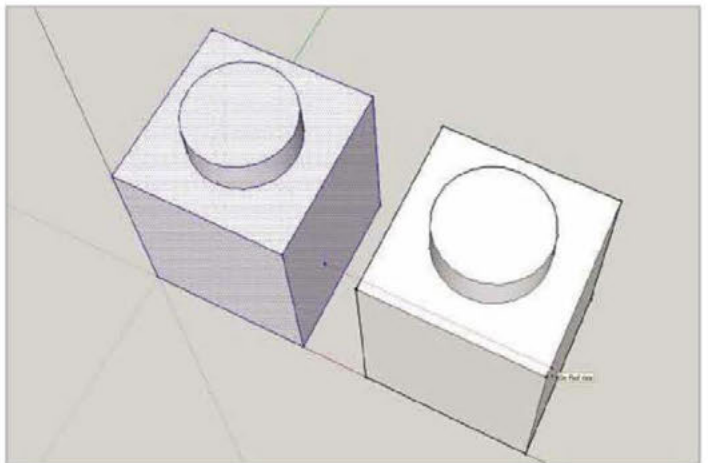


the link, and returns it to being just geometry again. If you wanted to keep it a component but change it, you would use 'Make Unique' instead.

This time we're going to use push/pull to make a brick that's one unit wide and ten units long, so we start by touching one face and pulling it along the red axis. A brick unit is 7.8mm, and one 10x long would be 78mm long. Given we have a brick's width already, we need to pull 70.2mm. Entering that value directly will create the right sized box.

That solves part of the problem, but it leaves lots of work to do with the pegs. Thankfully, there are a number of quick ways to create all of them. The simplest is to copy the existing one, after you've carefully selected it using a viewpoint where you look directly down.

When you move it, use the control modifier to make a copy and then enter 7.8mm to place it exactly where it should be in relationship to the first. And then, without doing anything else, enter 9*. Actually, I hit 10* by mistake, forgetting I already had one, and ended up with this, but you can see how it works.

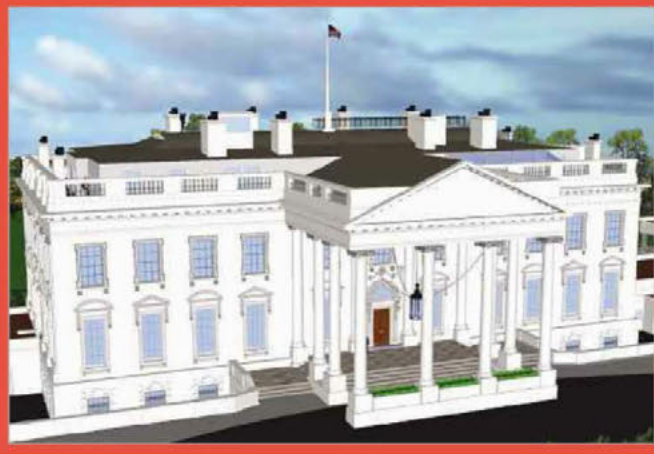


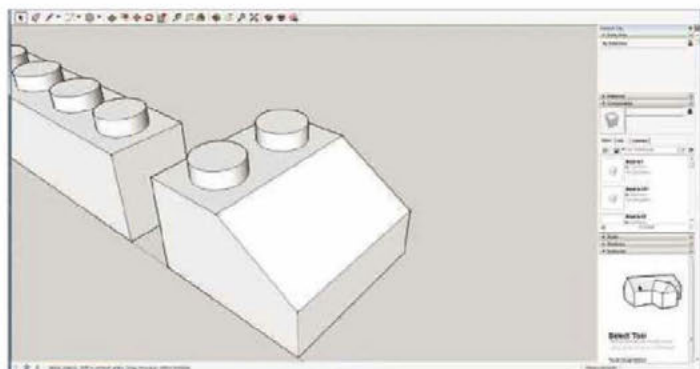
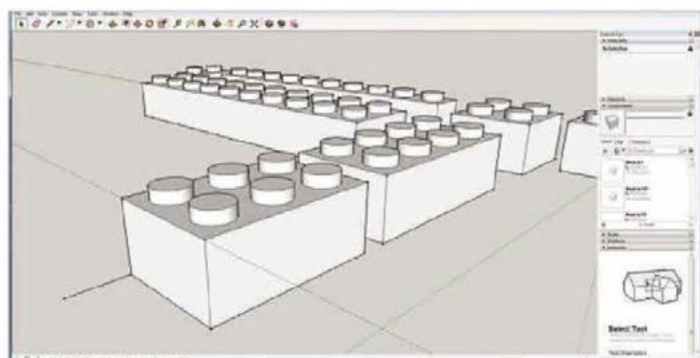
Alternatively, I could have moved the peg to the other end of the box, and then entered '9', which would have had the same effect.

Once I'd deleted the extra cylinder, I made the whole item into a component and called it Brick1x10. You can see by using this and the

Google Earth Modelling

When Google owned SketchUp, it was used to create detailed models for Google Earth, and you can still use it for that purpose.





“ As you expand your knowledge, you’ll progress to develop methods that generate the best results ”

combine, erase edges technique that you can make lots of bricks all sizes quickly.

And that’s what I did, turning them into components as I went, so I could then use them repeatedly to build a model as per the real things.

Beyond Simple Bricks

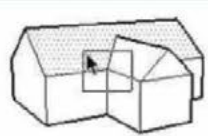
While I was modelling my bricks, I decided to add some bevelled types that you might use in a roof, and then I ran into some problems that you might well encounter.

To create these types of shapes, you simply use the line tool to create edges and then use Erase to delete the bit you don’t need. This, however, often makes holes in the object so you can see inside. If this happens to you, simply use the line tool to draw a line across that face, at which point it will become solid again, and then use Erase to remove the excess edge.

The other snag I ran into was that I made some assumptions about the slope gradients that turned out to be incorrect. If you look in brick catalogues, you’ll see they’re listed as being ‘30 degrees slope’ or whatever, and yet when you make them exactly that, using the protractor tool I’ll cover next week, you find that they’re angled wrong.

That’s because they’re not exactly, or something not remotely what they’re listed as, and you need to instead use the edge strip height as the critical measurement. Once I worked out that edge should be a certain size, I could just draw a line up a corner and then snap to that endpoint to create the correct cutting lines.

If things don’t fit, there’s usually a good reason that often starts with a wrong assumption.



Select Tool
Select entities to modify when using other tools or commands.

Tool Operation
1. Click on an entity.

Modifier Keys
Ctrl = Add an entity to set of selected entities

The Instructor
If you can’t remember exactly how to use a tool in SketchUp, don’t worry. If you look at the right-hand side of the work area, there’s a panel called Instructor that will tell you all the critical things you need to know about how it works. Keep that handy and you shouldn’t forget what keys to press or when to click.

Final Thoughts

Learning to use any powerful tool is a journey, and what I’ve covered so far are just the first steps. Hopefully, you’ll be more impressed with what SketchUp can do the further along I go with it.

What I can tell you is that the critical learning path has some similarities with other CAD systems I’ve used in one respect. There are often many ways to approach making the same item, and at least a couple of them are the right ways. Equally, some are definitely the wrong ways, and once you’ve used SketchUp for a while, you’ll begin to work out when you’ve chosen well or not.

As you expand your knowledge, you’ll progress to develop methods that generate the best results or make geometry quickly, though they’re not necessarily the same approach.

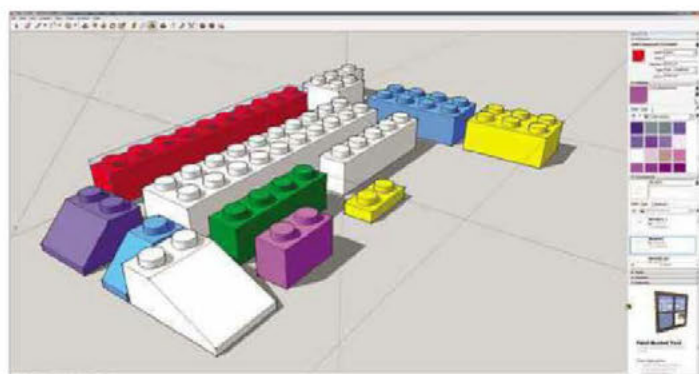
It’s also easy to critique others efforts, forgetting they may have made that chair or tractor wheel or whatever early on in their SketchUp experience. But I’ve watched enough SketchUp videos now to realise that some people get this product and what it aims to do from the outset, and others struggle with ideas promoted by it.

I accept that I’ve used CAD for over 30 years and have seen all manner of methods to construct shapes, but SketchUp is remarkably simple to follow once you’ve mastered the two-click method and understand how you can infer geometry from existing parts.

Because of that, I’ve formed the view that almost anyone with a basic understanding of scale and angles can learn to use SketchUp in relatively short order.

In the next part in the series, I’ll show you how to make some more complicated shapes, add fine details to them and explore what layers can do for your modelling technique.

See you then! [mm](#)





The Best Online Collaboration Tools

Make projects easier to handle with these apps...

Although the Internet has brought huge changes in our everyday lives, there's arguably no area where it's had more impact than business and communication. As a tool for keeping people in touch, only the phone can approach its success, and even that pales in comparison to the Internet, which enables free phone, text, and even video calls. All you need is a PC and an Internet connection. Business has boomed online in many ways, and there's simply no imagining a world without the Internet powering commerce and corporation any more.

When it comes to bringing together teams of people, there's no better tool, either. Collaboration is one of the key uses of the Internet, allowing people from around the world to work together as if they were in the same room.

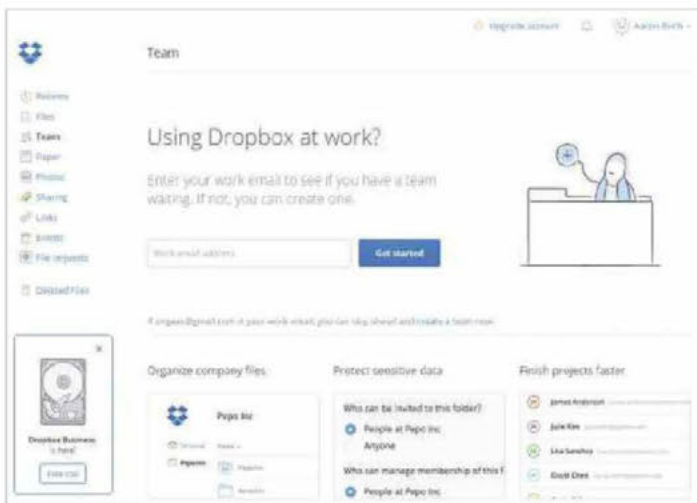
Initially, this communication was limited to text-based interaction such as email, message boards and chat, but as technology evolved, voice calls, video calls and video conferencing became the norm. Companies small and large routinely use the Internet for meetings. There's so much more that's possible, though, and today's Internet, thanks to the growth of cloud computing and storage, has brought with it new levels of collaboration. Now we have tools and software that make it possible to work together from anywhere in the world, in ways that we'd never had thought possible only a few years ago.

Online collaboration tools open up a whole new world of possibilities for business, small and large. Distance doesn't mean a thing if you have the right tools, and whether you're a major corporation that needs to host a large-scale meeting or seminar, or you're a home worker needing to communicate with a colleague, there are services and software packages out there to accommodate your needs.

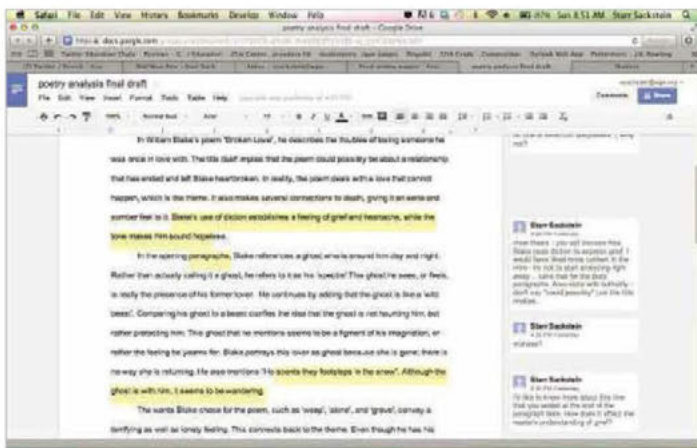
We're going to take a look at some of these, and we'll dip into both the paid and free options for those looking to bring their workforce closer together, and to utilise more efficient communication and work sharing.

What Is It?

We should begin by exploring what collaboration software actually is, and what it does. Simply put, collaboration software is made up of tools that allow multiple people to work together on a single task or project online. It allows people and teams to work together, even though they may be located in different geographical areas. Projects can be worked on by teams positioned around the globe thanks to the often cloud-based nature of such platforms. Collaboration tools are not just for distant communication and teamwork, however, and they can be



▲ File sharing and storage is the name of the day with Dropbox



▲ Google Docs has become the major player in online collaboration

just as useful for those working together in the same location, used instead as an easy way to centralise work and project plans.

The actual functionality of these tools and platforms varies, and there are many elements of collaboration catered for: messaging, white boards, document sharing, real-time document updating and video or phone conferencing are routinely included in such tools. Some packages are geared for specific functions, and require other tools to back them up, whilst others strive to be a full package, so to get the most out of them, you'll need on that's right for you.

What To Look For

What makes a good collaboration package, then? What kinds of features should you be looking for? There are many factors to consider, and these will vary depending on your projects and goals. However, there are some universal considerations you should focus on when selecting your package.

First, you need to try and find a flexible option, one that has plenty of communication methods. It's best not to settle for just one form of communication as this will limit your contact. Productivity will suffer if you need to schedule video conferencing for each and every session, when a simple text message will suffice. The more methods of keeping in touch you have in one package, the better.

It's also important to ensure your platform is easy to use. If you're working with a group, you can't assume everyone will be terms of computer literate or online communication savvy. Some may be far less capable using computers than others, but may still be essential to your collaboration. Picking an easy to use package is very important.

No project or collaboration is complete without some form of planning and scheduling. Working with multiple teams with no schedule is a recipe for failure, so any collaboration tool needs to allow the group planning and scheduling of tasks and goals. This ensures everyone is on the same page, and knows dates and deadlines.

Hand-in-hand with this comes real-time collaboration. It's all very well being able to access files and data from anywhere, but having to struggle with updates and overwriting changes can be a nightmare for complex projects. If two or more people are working from the same file, overwrites and loss of data can occur. Real-time updating is the answer here, and it means multiple users can update documents at once, and all changes are tracked and viewable instantly.

Finally, there's general file sharing and access. You'll likely be working with all sorts of files during your project, and so you'll need to be able to effortlessly share these with the rest of your team(s). Solid, dependable, and fast sharing is needed, and any collaboration tool worth its salt should allow this, be it working from files situated in the cloud, or downloading copies from a central server. Different methods will suit different needs, but all are welcome, and should always be available.

What Does Your Business Need?

Now, all of these concerns are fairly global. Most collaborations will benefit from any of these main areas of concern, but you should also consider any special areas your particular project needs. Some packages will possess features others lack, and some are designed for specific tasks. When looking for your software, keep this in mind.

For example, if you're going to be working on a project that has to store large amounts of data, online storage and access will be a major concern, more so than projects that may simply require access to a shared spreadsheet.

Projects that involve a lot of important team members around the world will rely heavily on constant communication and updates, so you need to pick an option that really does focus on this element, granting the best possible ways to stay in touch. Other projects won't need this kind of communication, instead needing only a central storage area.

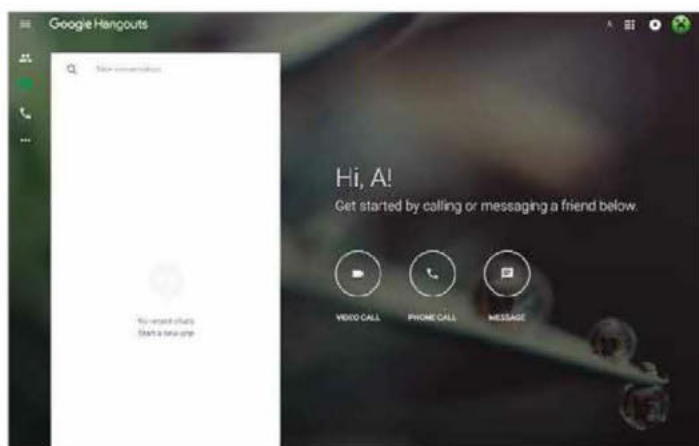
Consider this when choosing, as you can often save money if you go for a cheaper option that lacks features you're not going to use anyway. Don't be tempted to go for an all-singing, all-dancing option if you're not going to use the majority of the tools on offer, and don't rule out the use of two or more packages, as some naturally compliment each other.



▲ Slack is a modular tool that can be enhanced with various plug-ins



▲ *Skype isn't just for talking to Grandma, it's also a viable business tool*



▲ *Google Hangouts allows video chat for large groups of people*

The Tools

Now we'll have a look at some of the best collaboration tools available online. There are many types, so we'll try to cover as many as we can, but always take a look online yourself, as there are far too many to cover here, and we may not mention an option that's more suitable for you. Don't be afraid to experiment.

Dropbox

www.dropbox.com

When it comes to file sharing, few services are as accomplished. Dropbox has quickly become the go-to option for many, and it scales perfectly for small-scale sharing to large-scale collaborations. It's also easy to use, and all you need to do is share a folder to others that need to use it, and access to this is granted on their own device, of which the software supports many.

All team members will have access to the shared content, you can control access rights, and you'll receive updates about any modified versions. As folders are shared, updates are automatically synced, making it a very useful service for pretty much any project. When used in tandem with other tools, Dropbox quickly becomes a perfect option for remote data access. That are also a lot of way to expand free storage, so be sure to check the site for offers.

Google Docs

apps.google.com

Possibly the most popular online collaboration tool of them all, Google Docs is a powerhouse of collaboration, and it offers a wide range of office tools, all accessible from your browser. You don't need to have any office software installed, it's all handled by the cloud.

Users can create documents easily, and these can be shared with others using access rights. Importantly, Google Docs also features a live-mode that allows multiple people to work on a single document at the same time. This is handled in real-time, and is a superb feature, and one that makes managing complex projects and schedules a breeze. Even better is the inclusion of document history, so you can keep track of the changes made, and who made them.

If you need to work on any documents offline, you can also export anything from the web-client, so you can still work whilst you're on the go and not connected.

Slack

slack.com

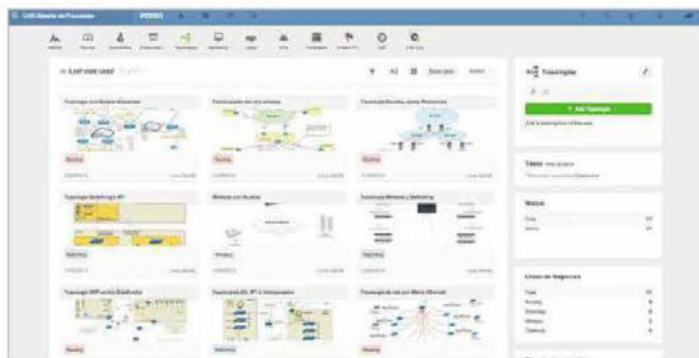
Flexibility is one of the main benefits of Slack, and it's a collaboration tool that puts communication at the forefront. It's use of chat channels, which can be ordered into custom groups makes communication with groups, be they large or small, easy. Past sessions are easy to search for, so you can retrieve information, and you can integrate a whole collection of tools with it to further enhance the platform.

The sheer utility of Slack is arguably it's best feature, though, and the aforementioned app integration opens up a whole world of possibilities. There's a long list of compatible apps, which can be found at slack.com/apps. These include design tools, development apps, office management, marketing, and much, much more. You can even integrate Skype, which is a great tool in its own right. The program is also free for smaller teams, with larger teams incurring a cost.

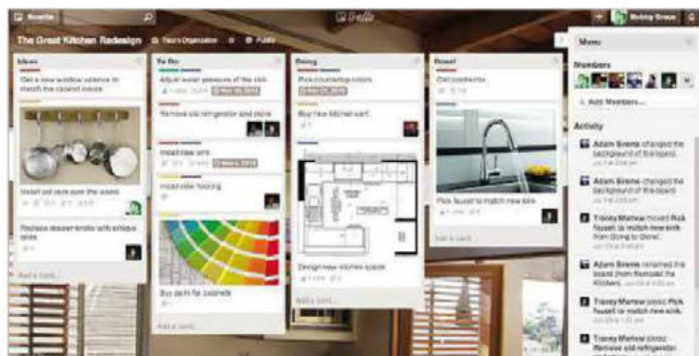
Skype

www.skype.com

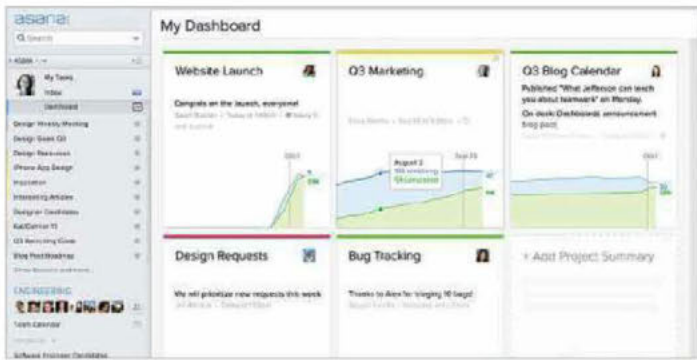
Skype has to be one of the most successful video chat applications on the market. It's easy to use, solid, and dependable. There's little bloat, and it's just as at home in the world of business as it is in the home when used to talk to friends and relatives. It's so popular, it's practically become a verb.



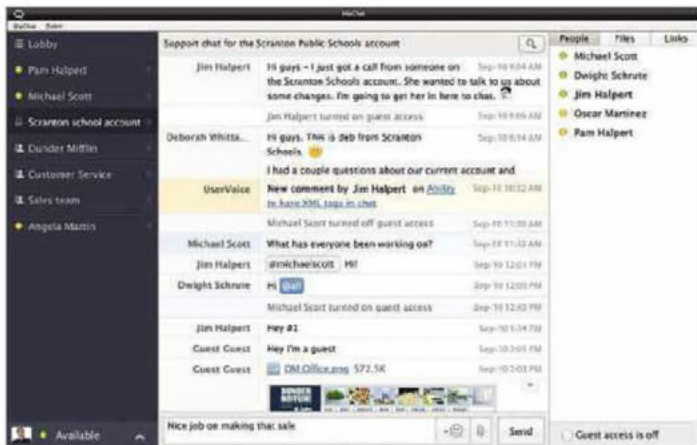
▲ *Podio is one of the most popular collaboration tools*



▲ *Trello is one of the easiest to use collab tools*



▲ Asana is one of the more powerful collaboration tools



▲ HipChat is a simple collaboration chat tool

Its high quality video conferencing features make it perfect for collaboration, and although it offers basic chat and file sharing, it's the core feature that's the draw. File sharing and chat are best served by other, more accomplished tools, leaving Skype to do what it does best.

Google Hangouts hangouts.google.com

Google's answer to the likes of Skype is a good accompaniment for Google Docs. Unlike Skype, which has a limit of 10 people per video conference (Skype recommends five for optimal performance), Hangouts has a far larger capacity of 100. This means even large companies can host video calls, packing in whole departments, not just a select few.

Another obvious benefit is the program's integration with Google's other services, such as Gmail, where it can import contacts. It's also received a lot of attention of late, improving the video quality and that of the overall service, making it a staple choice for many businesses.

Podio

www.podio.com

Podio is a powerful, and free collaboration tool that functions much like a business social network. It features various communication tools, such as chat, internal email, contacts, and so on, and integrates these with other business tools like project management, tasks, and user profiles that can be associated with other people and specific positions, such as managers.

Like Slack, Podio can also use add-on apps to further bolster its usefulness. These include tools like CRM, marketing, and HR apps. There's even an app builder that lets you create your own additions when you need something specific.

Trello

trello.com

One of the easiest to use options we've seen is Trello, which features a very simple and easy to manage GUI that helps label and order project tasks. Using a drag-and-drop system, elements of your collaboration can be manipulated and assigned easily, and it also has a great mobile device companion app, making it great for out of office workers.

The only downside to Trello lies in its main strength: its simplicity. The program can struggle when projects become more complex in nature. The simple interface and design doesn't scale well, so larger collaborations may need another, more powerful tool.

Asana

asana.com

Asana is a project management collaboration tool focusing on remote access and being flexible enough to deal with multiple projects on the go. Its interface isn't as clean as some (it can be customised), but it makes it easy to organise and prioritise work – and when you need to get down to the nitty gritty of a task, it's got you covered.

Using simple workspaces, task check-lists, and keyboard shortcuts, it's easy to manage, and you can easily assign tasks to other users, or add followers to keep them in the loop. The ability to prioritise tasks is also very useful, and makes handling multiple jobs much easier.

HipChat

www.hipchat.com

Sometimes you don't need all sorts of features for a collaboration, and you can do away with the advanced tools many solutions offer. You may simply need to chat and communicate with others. Enter HipChat, a tool designed for simple, effective communication that lets users create chat rooms for teams to meet up in. Here files and images can be shared, and one-to-one chats can be set up. Being multi-platform, this could work well with a more in-depth collaboration app.

Yammer

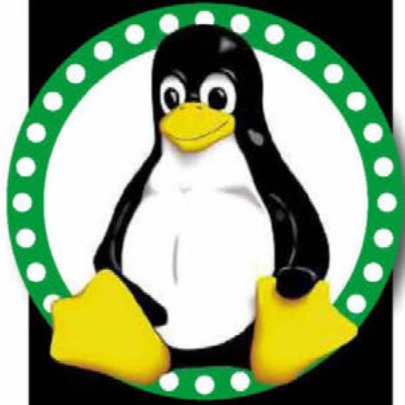
www.yammer.com

Owned by Microsoft, Yammer is a large-scale collaboration tool that's easy to use, but powerful enough for any project. Similar, in many ways, to social networks like Facebook, it uses profiles and groups to organise content – along with shares and comments, the ability to upload images, and other social media features. As it's a Microsoft program, it also integrates with office tools like 360, and a whole slew of apps you'll usually find in the average workplace.

That's just a handful of possible collaboration tools you can find, and all can help bring your workers or team member together, no matter what their geographical location, making the world a very small place. **mm**



▲ Microsoft's Yammer takes collaboration in a more social direction



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

It's All Gone A Bit Batty

No Dark Knight for Linux, sadly

The Warner Bros. release *Batman: Arkham Knight* may be labelled as one of the worst PC games of recent years, but it did, or rather still does, have its fans.

I for one never encountered any of the hideous glitches or dramatic slow-downs that the majority of the gaming public seemed to be complaining about – and that's on a fairly modest gaming machine too. I'll even go so far as to say that the game was quite good, and despite the negative press surrounding it, there's nothing like descending into a crowd of thugs and beating them senseless while dressed like a giant bat.

Sadly, though, it looks like Linux users aren't going to be able to live out their bat-related fantasies as the Caped Crusader.

Unhappy Batman

Ever since the game was pulled from the Steam library all those months ago, the developer, Rocksteady, has been under some strain to get the PC port of the game right. To its credit, there were several updates and fixes, and eventually the media quietened down when it came to having a pop at old Bats.

However, the negativity has just been raked back up again as Rocksteady and Warner Bros. both announced that there will be no Linux or Mac versions of the game in the

foreseeable future – which basically means never.

Users who pre-ordered the game for either platform can apply for a refund through Steam or instead opt for the Windows PC version of the port.

The Community

As you would expect, the Steam community was on quick to voice its opinions to the developer and the companies involved in the game.

"Your fail knows no bounds," one gamer declared. "Worst company ever..." said another. And that's just the ones without swearing.

Clearly, though, quite a few gamers are genuinely saddened by the lack of Linux and Mac ports, and they'd still happily buy the game, should either the developer or Warner Bros.

ever decide to get back behind the wheel of the Batmobile. I think this shows some decent manners and overall good non-troll like behaviour from the Linux community.

Batman And Beyond

So where next for the Dark Knight on Linux? To be honest, I have no idea. Perhaps someone could come up with a way to get the game running under Wine without any problems?

Alternatively, we could just install a Spectrum emulator and play Ocean's *Batman* game while we wait for DC's most beloved character to appear on our monitors.

▼ Poor Batman. No Linux port and now no ice cream either



Aural Delights

Sven Harvey listens to a few new remixes

AmigaRemix.com is a wonderful resource for those who enjoy music composed during the Amiga era, as it provides a virtual storehouse for a huge number of remixes of music from games and demo scene productions. These remixes are produced by amateurs, semi-pros and professional composers and remixers, who sometimes remix each other's music.

daXX

This remixer may not be a joined Trill but is certainly prolific, with the first Amiga Remix update of the year being heavy on remixes from daXX, who has a rather brilliant track record thus far, including a one of the final releases of last year!

Released on 21st December, the rather extensive remix of the theme from Spaceballs' scene demo State Of The Art by Travolta, Condom Corruption (daXX minimalist remix) foxxed me initially. But about 40 seconds in, it's suddenly obvious what it is. The rearrangement is quite a massive one, yet works well enough, and once it kicks in from the long intro, it makes itself known – not one for those who don't enjoy dance music that wouldn't be out of place at a rave, though.

Volker Tripp, aka Jester from the demo group Sanity, got daXXed in the new year with a remix of the music from the scene demo Elysium that Sanity released in 1991 at the Amiga Summit Convention in April that year, running on a base Amiga 500. The music in the demo was brilliant and has been updated into the 21st century

very well in daXX's usual style of all round enhancement rather than reinvention. Fantastic piece of music.

Another scene demo crew named The Silents or TSL morphed into something else – a team called Digital Illusions under which name they produced *Pinball Dreams*, *Fantasies* and *Illusions*. DaXX has remixed the rather great menu theme music from *Pinball Dreams* too, and this is very much worth listening to. Digital Illusions became Digital Illusions CE and is now known as EA Dice of *Battlefield*, *Battlefront* and *Mirror's Edge* fame. Just to round off daXX's releases for this round up – *The Secret Of Monkey Island*, and if you enjoyed that game, as so many did, the remixed main theme has to be worth a download.

Beast

Of course, in the aural realm you won't go too long without *Shadow Of The Beast* popping

up, and the January update included a track from new remixer Juggolo who has brought modern technology to the classic Eerie Forest theme from the original game, as composed by David Whittaker. This remix is very faithful to the original and brilliantly puts the game (or even the original viral rolling shop demo) into my mind, having essentially just provided an much better instrumentation to the wonderfully atmospheric theme. A definite download.

Check out all these MP3s and more at www.amigaremix.com.



David & Colin At Friend

Former Commodore UK co-managing directors David Pleasance and Colin Proudfoot have once again joined forces to be part of the management team of a technology start-up. These former teammates were everyone's favourites to buy Commodore as a whole from the liquidators in the mid-1990s. Anyway, after running into Friend Software Labs founder Hogne Titlestad at separate Amiga 30th anniversary events, they've joined to help bring the web-OS to fruition. CEO Arne Peder Blix completes the management team. Colin is taking the role of CFO, while David is the director of international sales and marketing.

The FriendUP OS (aka FriendOS) is an internet-based operating system being developed as a unifying platform (hence the UP). It has a user interface that looks the same across a wide range of devices, and it's very reminiscent of the AmigaOS in design cues and underlying concepts. The beta has just started, and you can find out more and request to join at friendos.com.



Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Amiga



Ian McGurran is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

The Shows Just Go On

Another week, another show, says Ian McGurran. But wait, it's MWC!

Yes MWC! You know, MWC! No? Okay, maybe Mobile World Congress might elicit a bit more excitement, despite the name? Yep, one of the biggest shows that's heavily mobile focused is upon us and, with it, new things! But what separates the likes of MWC from the earlier CES is the appearance of the big names, like Samsung and Sony, which bring their big names too. So what can we expect at MWC 2016?

Samsung

Other than Google, Samsung is still the most recognised technology company that flies the Android flag, and it's at (or around) MWC that many of its major mobile products make their debuts and, yes, this year that will include the latest Galaxy S handset. Actually that should read handsetS, as the Galaxy S is no longer just one device, and in Samsung's standard way, there are now multiple versions, depending on what the weather is or your height or something. Actually, unlike its endless budget range, the Galaxy S series is just (!) three devices, the S, S Edge and S Edge+, and it looks like the S7 is to continue that tradition. But, the S7 Edge+ may be substituted in the EU for the Note 6, to make up for the lack of a Note 5. Are you following this? Anyway, design wise, the S7 is very much in the mould of the S6, which is

fine as the S6 is rather nice, and while there will be a spec bump, the screen remains 1440p.

HTC

Taking a leaf from Apple's / Samsung's / their own book of not really changing the design that much, HTC's next flagship, the M10, is not changing its design that much. Actually the leaks show that's not quite true; it's more not-changing-the-design of the A9 that much. The M9 and A9 shared quite a bit of design, and the M10 looks to be the sum of the both, albeit also quite similar to another more prominent fruity phone.

Sony

Where exactly do you go when you already have a phone with a 4K screen on the market?! You won't be surprised to find that, like pretty much everyone else, refinement is the order of the day. Actually, the Xperia Z6 won't come with 4K as standard for now, like the Z5, and will likely run the 2016 standard of the Snapdragon 620 SoC and Android 6.0

Marshmallow. More interesting is Sony still holding the market for smaller-but-still-powerful handsets with the Xperia Z6 Compact, rumoured to run the Snapdragon 620 instead but still be very capable.

BlackBerry

Finally it's the Lazarus story of 2015. BlackBerry, the firm of the constant misfires and missed opportunities, somehow came up with one of 2015's best smartphones, the excellent Priv. Somehow finally coming to the obvious idea of combining its excellent hardware design with an excellent mobile OS (clue: not BB10), the Priv took everyone by surprise and garnered many year-end accolades. In an uncharacteristic display of straightforward thinking, it's expected BlackBerry will stick with this plan and announce the device currently known as 'Vienna', a Priv with the keyboard on the front, and a smaller screen. It may struggle to gain the consumer market back, but if MWC goes well for it, BlackBerry might well be back in the enterprise game.



BARCELONA 22-25 FEB 2016

Flicker Of Hope

Andrew Unsworth pens more thoughts on the Game Capture

Last week, I talked about gaming-oriented video capture cards and how I like to use them to capture video of the desktop, among other things. I also mentioned that I semi-impulse-bought an Avermedia Game Capture HD II. I say semi-impulse, because I'd seen it at a trade show, the rep said it'd do what I wanted, and I wanted to try something new, so I bought it online a couple of weeks later.

My main need is to capture 1080p video and record it straight to USB. The Avermedia can do that, but not without problems, as I'll mention later. It can also record input from a microphone, take input from a HDMI or component device and let users edit video on the fly. It comes with a handy remote control too, and this lets you access its on-screen display, which enables you to change resolution, format attached storage and review and edit video. You can even drop a 2.5" drive inside it so

it becomes a self-contained unit.

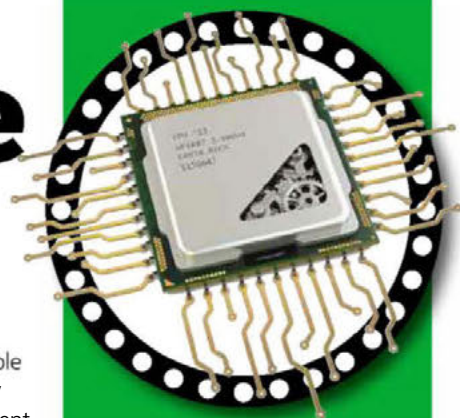
It's early days with the device at the moment, and I still haven't had a chance to give it a good going over. The good points so far are that it looks discreet, its connectors are well laid out and easily accessible, and it's easy to record video. The bad point is that when I hook it up to my PC, it defaults to a resolution of 1280 x 720 rather than 1920 x 1,080, and when I increase the resolution, the screen flickers terribly. The flickering is so bad, it's hard to look at the screen. I've no idea why the flickering occurs, and I can't find anything concrete about the problem online.

However, the flickering doesn't seem to occur when the video is played back, so it must be caused during transmission from the Game Capture HD II to my monitor. I'll find out why it flickers, but until then, I'll just record in 720p.

The other video capture device I considered buying was the Hauppauge HD PVR Rocket,

which is a smaller, more portable device that can be powered by USB. It has HDMI and component video inputs, and it also records direct to a USB flash drive or hard disk. I like practical design, so the fact that it has a large red button on top of it to start recording is a plus in my book. However, the HD PVR Rocket lacks a 2.5" hard disk/SSD slot, remote control and an on-screen interface.

I used to use the HD PVR Rocket a lot, I like it, and it would've made sense to buy one, but when it came to buying a video capture device, I fancied something different. The Game Capture HD II was also cheaper. As I said, it's early days yet with the Game Capture HD II, and there's more to discover. I still haven't tried to edit video on the fly or uploaded and streamed video to the web yet. To be honest, putting the Game Capture HD II through its paces will give me the best excuse yet to spend a weekend giving my WASD keys a workout.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner and his handshaking skills are second to none

Hardware





Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*



The Force Awakens

John Boyega's returning to provide the voice of Finn in *Lego Star Wars: The Force Awakens*, TT Games' affectionate parody of last year's sci-fi blockbuster

This week, Ryan takes a look at the latest Lego Star Wars game, and looks at the online reaction to The Division's closed beta....

Plug & Play

Marching to the beat of John Williams' iconic score, *Star Wars: The Force Awakens* has stormed the global box-office, with the movie taking just over \$2bn at the time of writing. As part of the full-on revival of the *Star Wars* franchise, TT Games has announced *Lego Star Wars: The Force Awakens* – the latest in its string of fun, breezy brick-based action games.

As with TT Games' other Lego titles, this one's a slapstick take on familiar scenes from a hit movie. The *Lego Force Awakens*' first trailer shows us such moments as the Millennium Falcon swooping across the surface of the desert planet Jakku or villain Kylo Ren igniting his evil-looking lightsaber in a snowy forest, but all in that lovingly slapstick TT Games style. Rey's speeder has a "BB on board" sticker attached to the side – a reference to diminutive droid BB-8 – while raffish pilot Poe Dameron is startled by a couple of slices of toast that pop up while he's flying his X-wing.

Lego Force Awakens will also offer more than a comic guided tour of last December's hit movie. TT Games have revealed that their *Force Awakens* will feature missions that bridge

the gap between *Return Of The Jedi* and the new sequel; in an interview with US magazine *Game Informer*, director Jamie Edén revealed that his game will help explain how C-3PO got that strange crimson arm, and exactly how and why Han Solo wound up with those huge creatures, the Rathtars, on his ship. It's worth noting that these extra missions – which will have to be unlocked by collecting gold bricks – are officially canon, too, since TT has been working with the Lucasfilm team that oversees the *Star Wars* universe's sprawling narrative.

"I can remember the first day on the project and we said that we'd be doing those sort of levels and content, and I couldn't believe that we were going to get to make our own content that was going to be part of the *Star Wars* universe," Edén explains. "We tell the story through the sort of Lego viewpoint as well, so the crux of the story is what happens is true to the IP, obviously we put gags in with characters holding sausages or riding around on pigs, *et cetera*."

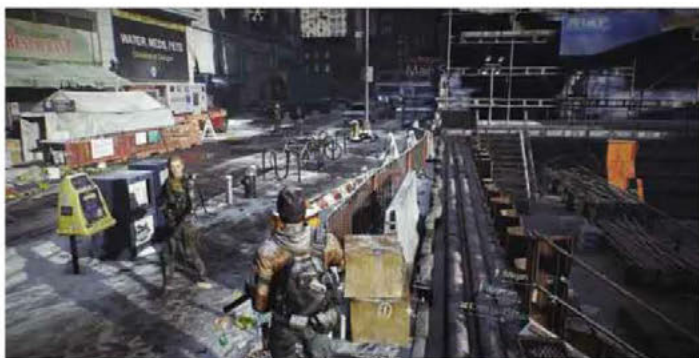
The Lego games' mix of platforming, shooting and collecting may be a familiar formula by now – the series is more than a decade old by now, after all – but it's their cheeky

humour and sense of fun that makes them so reliably addictive. Lego's take on *The Force Awakens* doesn't, at first glance, appear to do much to change up that formula, but it nevertheless looks like another disarmingly irreverent trip through Lucasfilm's sci-fi galaxy. We'll see exactly what's in store on the 28th June.

Online

In terms of sheer scale, *The Division* is among the biggest games Ubisoft has embarked on; an online RPG shooter set in a disease-ridden New York, its map is said to rival *Fallout 4*'s in terms of square mileage. The game has, however, hit something of a road bump on its journey to a full-blown release in March; during its closed beta phase, several PC users have managed to find a way to give themselves things like infinite ammo and super-speed.

Now, while cheating in online games isn't anything new, it seems that *The Division* is embarrassingly easy to hack, at least in its unfinished state: the game essentially saves key gameplay data to the user's machine, meaning it's comparatively simple to find and edit such values as XP and ammo count.



▲ A few players giving themselves infinite ammo and super-speed marred *The Division's* closed beta somewhat, but Ubisoft's online RPG-shooter still looks highly promising

"Almost all stats (excluding currencies and health) are calculated and stored on the client, and server just accepts it without any checking," one player wrote on Reddit. "You can have unlimited ammo in a mag, super-speed (this, actually causes players to go invisible also), any desired critical chance, no recoil, unlimited medkits and nades and so on and on."

The Division's three-day closed beta was somewhat overshadowed by complaints such as this. As stories about the cheating built, Ubisoft responded on *The Division's* official forum:

"We are aware of the cheating issues in the Closed Beta on PC," the company wrote. "The team

is fully committed to providing solutions against this and a system will be in place to ensure a fair experience for players when the game is released."

It's worth pointing out, however, that the wider response to *The Division's* beta has been otherwise quite positive so far. The game's depiction of a chaos-ridden New York is the most oft-praised aspect of the game, and its premise – reclaiming the city from various looters, gangsters and other criminal elements – certainly sets it apart from the horde of other post-apocalyptic shooters we've seen in recent years. The bigger question, perhaps, is whether Ubisoft can square the originality

of *The Division's* premise with the requirements of your average online shooter – one of the common criticisms levelled at the beta is that enemies often take a suspicious number of bullets to kill, even though they're wearing some kind of hoody rather than, say, a Kevlar vest. It's the kind of thing we're used to seeing in games that want to coax players into upgrading firearms, but doesn't it also fly in the face of *The Division's* sombre, realistic tone? Ubisoft still has time to adjust *The Division's* balance, of course; if some of the game's weaker aspects can be fixed in time for its launch, then it could well emerge as one of this year's most compelling online games.

The Division launches on the 8th March.

Incoming

The Division isn't the only online sandbox to launch in March. *Trackmania Turbo*, the latest in what is arguably the most entertaining racing series for the PC, is finally emerging after a delay. Once again, it'll offer a string of twisty and outlandish courses full of huge jumps and bizarre twists – one track design sees vehicles literally spinning through the air, while another sees players briefly drive upside down. It's this flagrant disregard for the rules of gravity that makes *Trackmania* such a thrilling series; with its usual suite of course-design tools and online competitions married to updated visuals, *Turbo* sees the series in better shape than ever.

Trackmania Turbo is out on the 25th March.



▲ Gonzo arcade racer *Trackmania* is back this March. *Trackmania Turbo* offers yet more competitive online racing and twisty, gravity-defying courses. Hurrah!

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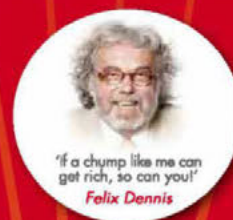
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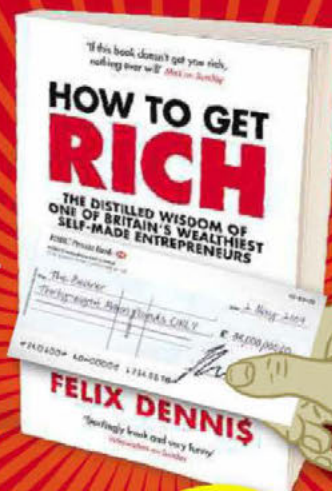
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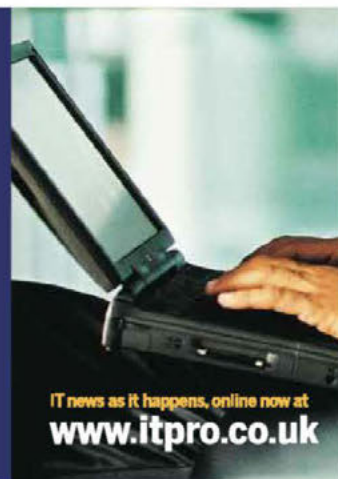
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HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad to MicroMartClassifiedAdverts@gmail.com and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: Tape drive backup. Either DAT320 or later generation LTO system in good condition. Please contact me.
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WANTED: You bought a Corsair water cooler, with a square block. You fitted it to your Intel processor. You want to make a few pounds from the spare A.M.D. bits? Contact me!
Email: johnrpeel@gmail.com

WANTED: Gigabyte GA-Z77X-D3H motherboard wanted.
Email: johnbeiry@gmail.com

WANTED: PC Tower case (beige colour if possible) to rehome an Amiga A1200 vintage computer. The Amiga motherboard is H 410mm x L 190mm (H 16" x L 7.5"). PSU not an issue but if available 250 watt more than enough.
Tel: Bill (07742) 061569 or (02641) 769503.

WANTED: 3G dongle for Archos 80 G9 tablet.
Email: alancox28231@gmail.com

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Sim City 2000: Boxed and original. Classic gaming. £15.00
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Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
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Email: a2345@btinternet.com

PCB design software. 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
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Email: cresswellavenue@talktalk.net
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Email: a2345@btinternet.com

Nuance Omnipage 18. OCR; Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Norton Family Premier 2.0. Runs under Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

SOFTWARE WANTED

Good Text to Speech program WinXP or 7 to read ebooks aloud for a pensioner with few resources.
Tel: Wilf James (01767) 699809

Wanted: PictureToExe software, for making picture shows.
Tel: (01202) 610602
Email: ivor.mary@talktalk.net

Wanted: Quicken 2001. I desperately require a copy of QUICKEN 2001, UK Edition. I need to reinstall the program but have lost my original installation CD.
Email: david.maddams@icloud.com

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We work very hard to police our classified ads, and make them as secure as possible.

However, please do your bit too and use the following guidelines:

- **Never - NEVER** - pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.
- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk
- Keep copies of all correspondence
- When sending out goods, at the least obtain a certificate of posting from the Post Office

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ASK AARON



Meet Aaron Birch. He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty and you're very much welcome to it!

Send your questions to:
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Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Never The TWAIN

In issue 1398 (Ask Aaron, Backscan) you didn't ask Mike if he was trying to use a TWAIN driver, I am pretty sure TWAIN drivers do not work in 64-bit programs, as I have the same problem with the 64-bit version of Paint Shop Pro. Twain can only be used in the 32bit version.

Charlie

I can't comment on the problem you're having with your copy of Paint Shop Pro as I lack the full details, but there are plenty of TWAIN drivers released that support 64-bit, including ones from Canon. Users simply need to visit the corresponding website to make sure they have the latest drivers for their OS of choice. It's simply a matter of making sure you have the correct 64-bit updated driver. To help, you should have a look on the Twain.org website, where you can search for relevant drivers (www.twain.org/about-twain/devices).

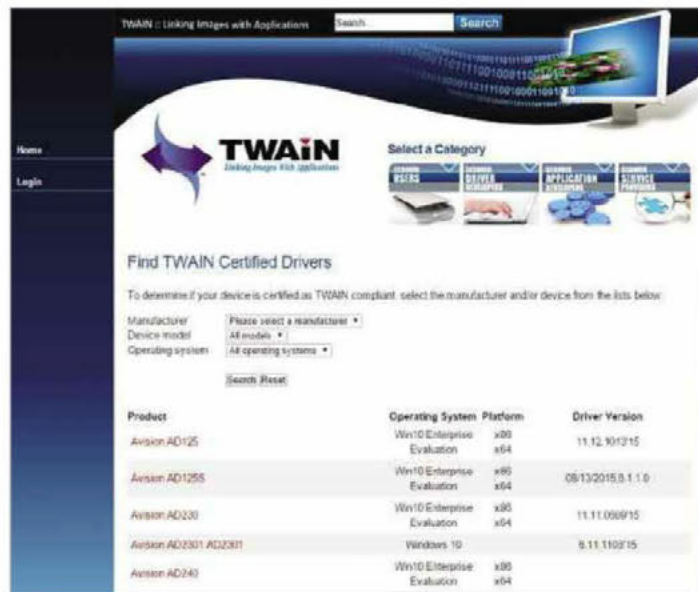
Paint Shop Pro should support 64-bit too, although I have seen that many users need to upgrade their actual scanner drivers. This is not inherently a problem

with Paint Shop Pro itself, so you may want to double-check your scanner manufacturer, and download any specific 64-bit drivers they have available for your model of scanner.

If you're still having problems, check out VueScan (www.hamrick.com). This is a the universal scanner driver that supports 2800+ different scanners, and is cross platform, meaning you can run it on Windows, Linux and Mac OS X.

That said, there are instances where some software doesn't support Twain in 64-bit, as you say. PhotoShop is one example, and Adobe has advised users pick a different option due to a lack of proper support. Other software has left the technology behind, but it's not a concrete thing, and there are ways around it, including the use of plug-ins.

▼ You may need to install updated TWAIN drivers for 64-bit applications



Blind To Optics

I have just updated my PC from Windows 7 to Windows 10. However, since doing so visibility of my Optical Drive has disappeared. Attached is my computer spec as built by myself in December 2010. How can I get my Optical Drive back?

Robert

If you've done a straight upgrade to Windows 10, it's likely that your old driver is simply incompatible with Windows 10, meaning it can't recognise the hardware. To remedy this, you may need to locate and download any updated drivers from HP, the manufacturer of your drive. Sadly, I checked over at HP for your model, and there are no drivers listed.

So, to begin, you should check to see if Windows 10 has any generic drivers it can use. To do this, go to Control Panel > Device Manager. Locate and uninstall your HP optical drive. Now, reboot your PC and see if Windows picks it up, either automatically, or by using Control Panel to manually install the drive.

Failing this, you may be a victim of the Windows 10 installer's generic IDE/SATA

driver. This has been known to cause missing optical drives. To fix this, the best way is to install your motherboard's correct chipset driver manually. Download the latest version from the manufacturer website and install it. When you reboot, the system should recognise your optical drive again.

▼ Windows 10 may not recognise your optical drive after upgrading; if so, re-install or upgrade your drivers



Foreign Recovery

I have an older desktop PC from Compaq, which runs Windows 7, and I'm having problems with it. Basically, it's really unstable, and is prone to lock ups, and running slowly. I'm certain I've never reinstalled Windows, as I have, for a couple of years, not been able to locate the system recovery discs for it, and I didn't have a copy of Windows supplied.

I have found some different Windows 7 recovery discs for another computer we have (a Dell), and was wondering if there's any chance I could use these to recover the HP PC. Both systems are Windows 7 and are about the same age. It would save me a lot of time and money finding a copy of Windows 7 and manually reinstalling Windows, that's for sure.

Jake

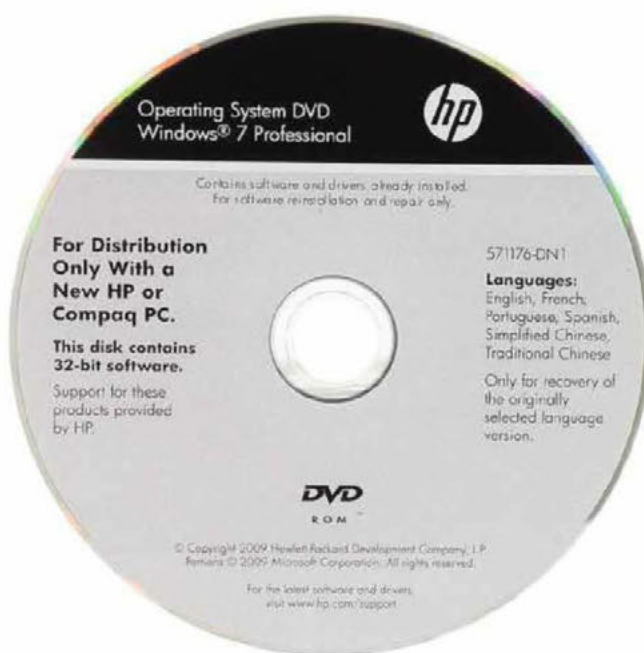
I very much doubt you'll be able to use the Dell recovery disc on the HP machine, Jake. Such discs are created specifically for the system specification they're shipped with, and they're basically a blank image of the factory default system. As the internal components will be different between the HP and the Dell machine, the recovery disk will probably fail. If it did manage to work, I doubt Windows would work, or even boot properly.

Aside from the technical problems, there's also the legal licensing matter to consider. The OEM license for the copy of Windows residing on the Dell recovery disc is for the Dell machine only, and isn't transferable. Even if it were, your Dell machine is probably using the license anyway, and it's single use only, so cannot be used elsewhere.

It may be worth checking your documentation, or looking through your Start Menu to see if the HP system has a built-in recovery partition you haven't noticed. Many systems do, especially if they lack an actual Windows disc. This will allow you to restore your PC to factory defaults, and would save you a lot of effort.

Your could visit the HP website, where you may be able to acquire an HP recovery disc. We'd recommend you visit support.hp.com/au-en/document/bph07143, and have a look for your specific PC model. If you can find it, you should be able to download the image, which can be mounted on disc or USB, and restore your PC. Failing this, you'll need to find a copy of Windows, and start again.

▼ **System recovery discs are created for specific system builds, and are not usually suitable for other PCs**



Low Volume

My PC's audio appears to be very quiet, even though I have the volume slider turned up all they way. I know different speakers have their own natural loudness levels, but this just seems to be wrong, as it's so quiet compared to any other PC I've had. Even my phone is louder! Do you know how to fix this? I'm running Windows 8.1.

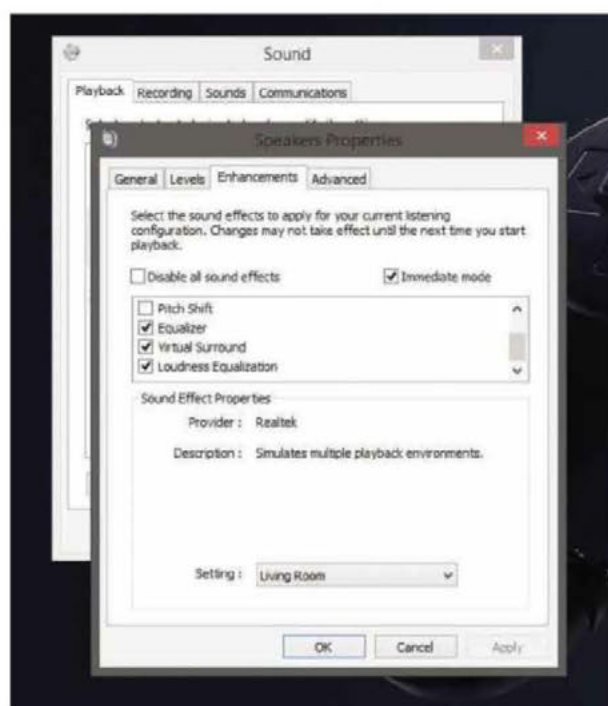
Dave

Without knowing the make and model of audio chip your system has, or the system itself, I can't comment on the hardware installed and what problems that may be causing, but I believe there may be something you can check, and that's Windows' 'loudness equalization'.

To find this, go to Start and type 'manage audio devices'. The search should find the audio device properties, so click it. Highlight the audio device that's outputting your audio and click Properties, then go into the Enhancements tab. Scroll down the list to locate the Loudness Equalization option. Make sure this is ticked, and click Apply.

This simple step could solve your problem, if it wasn't already ticked, which I suspect is the case as it stands. After that, I'd also recommend you check the correct audio device is being used as the default audio out for the system, if it isn't, then that could also be the cause of your problems. If nothing works, come back to us with some more details on your hardware.

► **Not having loudness equalisation can lead to a very quiet system**



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Panel Beater

Just over a year ago I bought an HP 250 G3 laptop. It came with Windows 8.1, and recently I upgraded to Windows 10 – but not for long! Unfortunately, whenever I booted the laptop up from cold, there'd be no backlight (making the display very dim). It would return if I shut down and restarted (not just a soft reset). Oddly, this didn't happen on battery power, and I found I could toggle the backlight by turning the mains adaptor on and off.

On the advice of HP, I connected an external monitor. The laptop's backlight would work, but the display on both screens was only about one-third the normal size. This would happen on the laptop's screen even if the external monitor was switched off (but still connected). Bizarre.

HP suggested new chipset and graphics drivers (as did Microsoft), but these just produced error messages about incompatibility. HP eventually claimed the laptop's motherboard needed replacing – at a cost of nearly £390, more than I paid for the laptop when new! In the end, I gave up and went back to Windows 8.1, which is where I'm at now. A strange one, eh?

David Howse, BT

Strange indeed, Dave. A real head-scratcher. At first I was convinced this was a hardware problem, and to be honest I've not swayed too far from that opinion. You see, a laptop's backlight fires up pretty much as soon as the power button is pressed – long before any OS gets loaded. If yours was dead even in the BIOS or UEFI, it wasn't a driver problem. There was faulty hardware. This was backed up by your ability to toggle the backlight on and off. I suspect the one-third-size display was a red herring, probably related to a resolution setting.

Are you quite sure the backlight works properly now you've returned to Windows 8.1? Have you tried going back to Windows 10 to see if the problem reappears? Maybe there was a dodgy internal connection somewhere that's now corrected itself – or it could simply have been that the cable was loose on the power adaptor. Or maybe the problem's intermittent.

If a repair's needed, forget about a new motherboard. And £390? You were probably born in the night, but I bet it wasn't last night. All you're after is a replacement LCD panel (which will have an integrated backlight) – under £40 on eBay. In the past, with CCFL

“ It wasn't a driver problem. There was faulty hardware ”

backlights, trouble could also be caused by a failed inverter (a replaceable PCB), but most modern panels use LED backlights and are inverterless. Yours is such a panel.

Of course, if I'm reading matters wrong, Dave, and your laptop's backlight only played up once Windows was actually loaded, that would indeed have been a software problem. I've never personally seen anything like that with Windows 10, or with any other OS, but I guess there's always a first time. So please write back. At what point in the startup process did the backlight trouble occur? Put us all out of our misery!

▼ *I can't find a decent picture of a screen with a broken backlight, so here's a picture of some nice back lights*



The Missing Link?

I need to make Internet access unavailable throughout the night. I have a TP-Link TD-W8970 router, and TP-Link's support people, in their wisdom, advised me simply to switch it off. I've tried this, but my young teenagers just sneak down and turn it on again. I'd hoped I could use the router's parental controls without having to specify the MAC addresses for their myriad devices or create a website blacklist, but it's not that easy. Even if I fitted a timer to the router's mains socket, this could easily be overridden. Any suggestions on how I should proceed?

Paul Williams, Outlook.com

I'm with TP-Link, I think. Please don't shoot me, Paul, and I'm in no way intending to preach, but I reckon all you need to do here is be firm. Years ago, my lad liked to play online games when he was supposed to be doing homework. I simply made it clear that if this continued I'd take his Xbox 360 away. Just the threat – you need to be willing to carry it through if needed, though – would usually be enough. Couldn't you do something similar – confiscate your children's devices for a few days if they won't go to sleep?

I'm no parenting expert and, heaven knows, I'm not the world's best dad – like you, I just do the best I can – but I believe happiness and a successful navigation through life require self-discipline. Sometimes children need a push to develop it (some adults too –

myself included!). I know this is a computing magazine and I'm supposed to sing the praises of all the latest gear, but I don't think you need technology here. Here, technology is the problem, not the solution. Just don't shoot me, Paul! This is only my opinion and yours is equally valid.

▼ **Often the best way to combat overuse of gadgets is simply to take those gadgets away**



Clean Sheets?

I've created an Excel spreadsheet containing VLOOKUP formulas and also some data validation. At home, it's fine, but when I come to show it to others at college, the spreadsheet's tabs aren't there. Also, data validation won't work – the drop-down menus are locked. I've looked in Excel's options at college and can't see anything that might be causing a problem. Oddly, I can get data validation to work if I create the data at college – this is using the same spreadsheet – but only if it's all on one tab. What's going on? I've attached the spreadsheet in question.

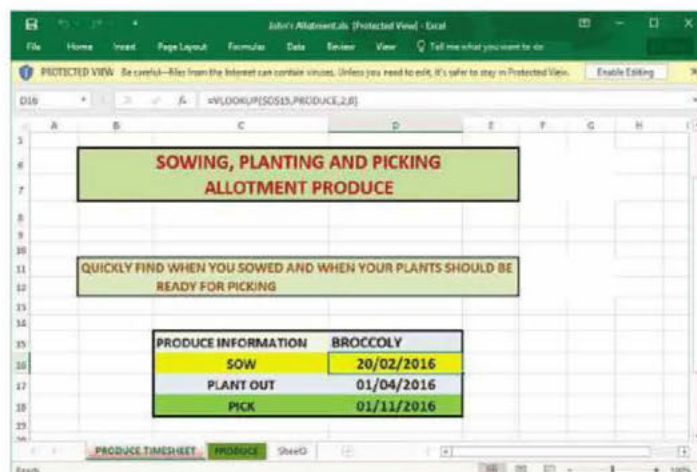
Bryan Jones, Virgin Media

I use Excel a fair bit – years back I created an entire stock-control system that really should have been done in a database program – but I can't say I'm too familiar with VLOOKUP and data validation. A few things occur to me, though, Bryan. First, your file is in the .xls format, which went out of favour at Microsoft with the launch of Excel 2007. Can you save it in the .xlsx format? It could be that the college computers are having to open it in compatibility mode, and quirks aren't uncommon with that. Mind you, I'm not having any trouble at my end, and I'm running Excel 2016.

Second, initially your spreadsheet opened for me in Protected View, with Excel warning (wisely) that files downloaded from the Internet could pose security risks. Data validation absolutely wouldn't play ball until I'd clicked the Enable Editing button. Could it be that the college computers don't allow users to do this? It would explain why you're able to work with newly created data but not with imported data.

Finally, I think VLOOKUP or data validation or both are treated as macros, so the answer might be to save your spreadsheet as macro-enabled – that is, in the .xlsm format. It's worth a shot, but I fancy that if this really was the issue, the spreadsheet wouldn't function correctly even on your own PC (not once you'd saved it and reopened it). However, if macros are involved, the college computers probably don't allow them to be executed – macros can be disabled by default. You may well be able to scour through Excel's settings and re-enable them, but no doubt that would ignite the wrath of the lecturers.

▼ **The side-effect of increased security is almost always decreased usability (remember UAC in Vista?)**



Crowdfunding Corner

This week's pair of crowdfunding projects are all about simple robots that help you blur the lines between physical and digital media – at least, in their own ways

iBoardbot

The iBoardBot is a digital plotter with Internet-connectivity. If you don't remember the days when such devices were a staple of in offices, that means it's essentially a printer that uses an actual pen to draw and write instead of microdots, it's capable of creating pictures and text that look hand-made, even though they're not. As a whiteboard, it's also capable of erasing its contents, meaning you can use it for hundreds of purposes – notifications, adaptable signage, even as part of a collaborative physical space that's controlled from a digital one.

From anywhere on the Internet, you can use the bundled app to issue instructions to the iBoardBot, and a built-in API allows it to do things like track specific Twitter accounts, interact with IFTTT recipes, or scrape data from a variety of other sources. Based on an Arduino board with wi-fi connectivity, it's also possible to expand and alter the hardware (assuming you're the hacking type).

The project's target of £11,000 seems fairly likely to be reached – they're at almost £5,000 with over more than four weeks to go – and you can pick up complete or partial kits for building it, plus the necessary software, for somewhere between £100 and £200 depending on how much work you want to put into making it and whether you want a customised glass colour.

URL: kck.st/1SiV2eT

Funding Ends: Thursday, March 10th 2016

Foldio360

Making 360° images can be difficult to do without professional equipment, and an all-in-one 360° solution can cost thousands of dollars to assemble, making them unaffordable for individuals and small businesses that want to experiment with the format. The Foldio360, however, promises to allow the creation of such images using nothing but a smartphone and a lightbox.

The device itself contains Bluetooth connector and IR sensor so that it can be controlled remotely, while the HALO EDGE light system prevents any visible boundary lines between the object and its background. The software is compatible with iOS and Android, and can also, the creators say, interact with any standard DSLR system.

The project has already – unsurprisingly – proven extremely popular, more than tripling its initial goal of \$80,000 (£55,000) with more than 50 days to go until its deadline (at the time of writing). Kickstarter pre-orders for the system start at just \$89 (£61) plus shipping, which will get you the Foldio360 collapsible studio, the Foldio360 mobile app, and the connected 360 online platform to get you going in the simplest way possible.

The funding campaign is running for a long time, but don't let that put you off – we're promised it'll be shipping in July 2016, so there'll be time to try it out in the summer!

URL: kck.st/1Qtyxhi

Funding Ends: Thursday, March 31st 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Collins British Wildlife

David Hayward finds out that not all creatures grunt and stink

Despite it being February, the weather outside is surprisingly mild. As Facebook reminded me recently, it was only four years to this day (at the time of writing) that we were knee deep in snow and enjoying the only hill in Suffolk for a spot of sledging.

As such, we can take long walks through Walberswick and the surrounding area of natural beauty and take in the various fauna that's around this time of year.

Since I know very little of animals, other than the ones that appear on my plate with a selection of vegetables, I thought it was time to brush up and embrace my inner David Bellamy.

eNature

Surprisingly, the nature apps I found weren't all that great. Most crashed after a short while and many promised much but delivered very little. The last one I tried, though, did a far better job.

The Collins British Wildlife app, from Mydigitalearth.com, is easy to use and works well. It's an interactive version of the popular *Collins Complete British Wildlife Photoguide* and features more than 1,500 species of flora and fauna that you're most likely to come across in the British Isles.

The creatures and plants you may witness are broken down into categories: mammals, birds, reptiles, amphibians, fish, butterflies and moths, insects, spiders, trees and shrubs, grasses, fungi and a host of other wild and wonderful things.

Once you see something, a bird for example, you simply tap the Bird category and scroll through the marvellous selection of colour photos until you find the one you saw. If you then tap the image of the bird you spotted, you'll be presented with a wealth of information regarding the critter in question, along with any unique data such as its rarity value, the habitat it favours, common dimensions and male and female identifying markings. Also, you can start to build a list of the nature you've observed through the automatic creation of a My List, which is broken down by date of sighting. It's really very good and, once you get into it, quite interesting.

The database of images and information comes down in a separate 24MB file, which is a little bit daunting if you're up to the limit on your data allowance, so installing this while on wi-fi is certainly the best advice. However, once the data is down, then there's nothing else needed, and you can even enjoy the app during those moments when there's very little or no signal at all.

Conclusion

I found this nature app to be really interesting, especially from someone whose contact with nature is usually served with potatoes.

Just plug in some headphones, open up the Collins British Wildlife app and become one with nature. However, it does cost £6.99. [mm](#)

Features At A Glance

- Over 1,500 detailed images.
- Huge amount of data on every conceivable UK critter or plant.
- Compare two species side by side on a single screen.



▲ The categories are easy enough to work out



▲ The My List records all your sightings and when they took place



▲ Side by side images of nature, in glorious technicolour!

Logging Off

The term 'smoke and mirrors' is often bandied about when it comes to company results, but in the tech industry I'd suggest they rebrand quarterly earnings as the 'flimflam' reports.

What governments actually allow companies to get away with in respect of declaring their successes or failures is amazing, and it's something of a nightmare for those who wish to invest in them.

At one extreme of this spectrum, we've got Toshiba, which is now admitting that it artificially inflated its previous profits by

a whopping \$1.2bn, meaning it made a \$6bn loss in this financial year.

And that highlights the downside of this particular shell game. Once someone lifts all three shells and discovers no pea, the game is well and truly up.

So why do they do this? Well, it's often because the senior people are motivated by short-term gains, like getting a bonus or keeping their job a little longer to get a bigger retirement bung, or because they're embarrassed that they've made poor decisions.

Yet even companies that aren't in Toshiba's dire situation can't help but muddy financial waters when it comes to revealing how they're doing to the stock holders. Take my favourite dartboard, Microsoft. It's taken obscuring the true success and failure of its various endeavours to dizzying new levels. It's just posted an increased quarterly top line operating profit of \$6bn on revenues of \$23.8bn (which was a little down compared to the same point last year).

However, achieving an oranges-for-oranges comparison isn't easy, because Microsoft entirely reorganised its business divisions, cleverly combining those that make money with those that effectively chuck it away.

That also helped it avoid saying how many Surface tablets it had sold, what income Office on iOS actually made, how much its abysmal phone performance is costing it, and a thousand other really obvious questions anyone would reasonably ask about its business.

No, instead it wittered on about its commercial cloud offerings (mostly Azure) and how it had doubled its Enterprise Mobility Solutions year on year. That would be great, if Microsoft had ever told how many it had sold last year, which it didn't, so that could easily have been a couple that turned into four.

I know these are financial results, but on one hand, it talks about selling 19 million Xbox One consoles, and then it embraces cloud

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services performance with such globally accessible terms as “annuity renewals”.

Its sad phone story is almost entirely cloaked, since Microsoft lumped the withered stalk of the Nokia tree in with the Surface and Xbox One businesses.

According to Satya Nadella, Surface is a \$1.3bn revenue success (note, no profit), and that’s combined with the previous 19 million unit glory of the Xbox One (again, no profit) and the dire Phone sales (huge hole). And the detailed information provided for that combination is that ‘Devices’ revenue decreased by 26%, not that I’ve any idea what it was last year.

So are we clear? To summarise: good, bad, really bad, ‘Windows Phone Is An Ex-Platform’, let me hide these numbers for you, Aw, look! A baby wolf!, and PC sales are “a relatively flat market”, so beware of bumps.

Why company heads aren’t automatically enrolled in the Magic Circle with a performance like this is truly beyond me.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Impersonation, 8 Aplomb, 9 Spades, 10 Woomera, 12 Block, 14 Stall, 16 Migrate, 19 Jostle, 20 Unsold, 22 Vexillologist.

Down: 1 IMAP, 2 Megohm, 3 Isobars, 4 DNase, 5 St Paul, 6 Power Cut, 11 Outmoded, 13 Rituals, 15 Latvia, 17 Resign, 18 Reply, 21 LISP

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. Do you believe in fate? We don't. But we do believe in weird coincidences, though. This week, for example, we began reading a book entitled The Physics of Star Trek by Lawrence M Krauss. In it, he talks a fair bit about the curvature of spacetime and the idea of gravitational waves. All very interesting (and confusing) stuff. Anyway, this is

usual reading for us, so how odd that at time when we’ve thinking about gravitational waves, real scientists actually announce they’ve detected them for the first time. Okay, maybe not that odd at all, but it seemed weird to us. Maybe in an alternate universe somewhere, there’s a version of us that’s far less impressed. But we digress. Back to the ground-breaking discovery about our universe. These waves are apparently quite a big and can reveal all kinds of wonderful things about the universe, possibly letting us observe the very beginning of its formation. Also, if the video we watched on the BBC News website is anything to by, they also look like a Windows screensaver from the 1990s. Exciting stuff. Exciting stuff, indeed.

THIS WEEK'S CROSSWORD

Across

- 7 A valuable possession which its owner cannot dispose of and whose upkeep exceeds its usefulness. (5,8)
8 Impart or communicate information or knowledge. (6)
9 The first atomic bomb was nicknamed this by the scientists of the Manhattan Project. (6)
10 Compounds that exist in forms having different arrangements of atoms but the same molecular weight. (7)
12 An API and communications protocol that regulates communication between software and digital imaging devices. (5)
14 The tenth letter of the Greek alphabet. (5)
16 A three-pronged spear, especially as an attribute of Neptune or Britannia. (7)
19 Burn the surface of something with flame or heat. (6)
20 Devices that explode in midair and release a massive burst of electromagnetic energy sufficient to disable computers and telecommunications without killing people or damaging buildings. (1-5)
22 A compulsory contribution to state revenue on the amount by which the worth of an article has been increased at each stage of its production or distribution. (5,5,3)

Down

- 1 A unit of subjective loudness. (4)

- 2 To take long strides in walking – as people used to say. (6)
3 Major US manufacturer of laser printers and enterprise software. The company is headquartered in Lexington, Kentucky. (7)
4 An arcade game published by Sega in 1982 in which the player controls a red penguin that resides in the Antarctic. (5)
5 A dark area or shape produced by a body coming between rays of light and a surface. (6)
6 Adobe’s desktop publishing software application. (8)
11 Popular video messaging application in which users can take photos, record videos, add text and drawings, and send them to a controlled list of recipients. (8)
13 People you connect and share with on Facebook. (7)
15 Award-winning graphical browser-based MMORPG written in PHP and C/C++ and set in a futuristic universe where players interact and compete in space. (6)
17 Derogatory term for people seen as lifeless or mechanical. (6)
18 A deformation of an object in which parallel planes remain parallel but are shifted in a direction parallel to themselves. (5)
21 The periodic variation in the intensity of sound due to the superposition of waves differing slightly in frequency. (4)



In Next Week's Micro Mart*

- Audio special! Wireless speakers, soundbars and streaming services
- How to clean up your PC and get it running smoothly again
- Avoiding the big security risks
- Plus the usual mix of news, features, reviews and advice



* May be subject to change

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